THE MONTHLY

Review

Official Organ of the American Electroplaters' Society
A Society for the Advancement of the Science of Electroplating

FEBRUARY ✦ ✦ ✦ 1945

RECENT CLEPO DEVELOPMENTS *for Descaling*

(a)

CLEPO 180-S and CLEPO 195-A for Aluminum Alloys

(b)

CLEPO 181 for Copper and Copper Alloys

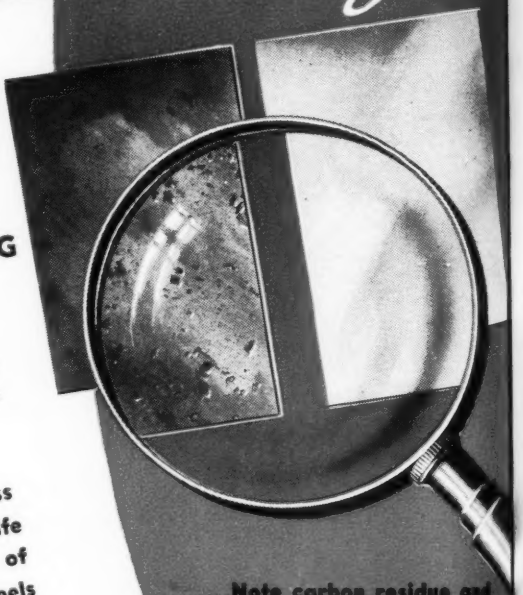
(c)

and THE NEWEST STARTLING DEVELOPMENT CLEPO PICKLE AID "SS"

a wetting agent which possesses remarkable inhibiting properties for ferrous metals.

- decreases pickling time
- decreases acid drag-out loss
- increases pickling solution life
- makes possible pickling of high-carbon and alloy steels without obtaining a carbon smut.

A demonstration by our CLEPO Service Man will leave no doubt as to the merit of these compounds.



Note carbon residue and pitted surface on high carbon steel when ordinary pickle is used, as against white color and unpitted surface when Clepo Pickle-Aid "SS" is added to ordinary pickle.

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When you apply the Oakite technique, using Oakite Compound No. 84-A, for stripping anodizing from aluminum work racks, straps, hooks and rejects, you will find that the job is done QUICKLY . . . SAFELY! The basis metal is uninjured, rack dimensions are not affected by the COMPLETE removal of the insulating oxide film.

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A: **USE DU PONT ZINC BALL ANODES!**

Q: Why these, in particular?

A: Every Du Pont Zinc Ball Anode is embossed with the Du Pont oval trade-mark, together with a "Z" for *zinc*. You can tell at a glance it's a *zinc* anode and a good one. There's no chance of confusing it with cadmium.

Q: Are there any other advantages in using these Du Pont anodes?

A: Plenty!—They're cast from highest quality zinc. They're pure. They're uniformly dependable. And they're stocked in many cities throughout the country. No matter where you're located, you'll get quick delivery! And Du Pont Technical Service is always ready to assist you with advice on the best use of these ball anodes and on any plating problems you may have.

Q: How can I get more information?

A: **JUST CLIP THE COUPON BELOW!**

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*Name*_____ *Title*_____

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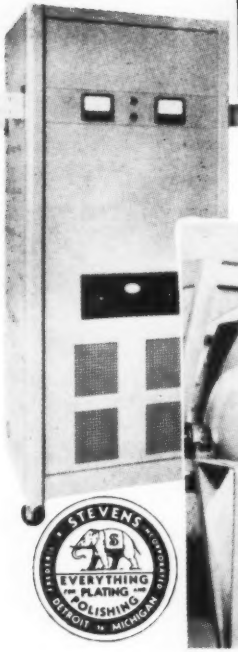
*Address*_____



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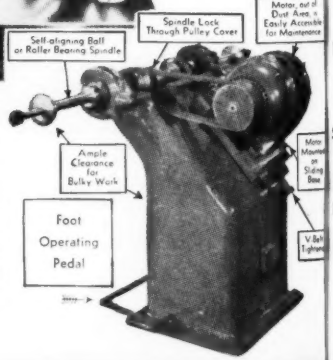
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THE MONTHLY

Review

VOLUME 32 • FEBRUARY • NUMBER 2

Published Monthly
By
AMERICAN
ELECTROPLATERS
SOCIETY
545 Fifth Avenue
New York 17, N. Y.

Publisher
JACK BAIN

Editor & Secretary
E. T. CANDEE

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Subscription: $3.00 a year

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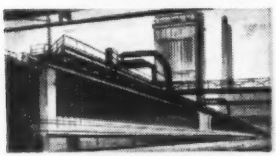

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FOR AMERICAN INDUSTRY

DEVELOPMENT AND PROCESS OF HARD CHROMIUM PLATING WITH A UNIFORM BLUISH GRAY COLOR

BY ALBERT HIRSCH

Introduction

WHEN monel metal became a strategic metal and could not be obtained for the purpose of building antennae, mother of invention came to our rescue; hence, the subject matter of this paper.

By a special process of electrodeposition of chromium, we were able to coat admiralty brass with a coating and color paralleling monel metal.

Telescopic antennae (the type under discussion) have a basis metal of admiralty brass and are constructed of brass tubing of O.D.'s and I.D.'s to slip inside of one another. To be more specific, the O.D. of the tubes at one end for a length of $\frac{3}{4}$" are swaged; this reducing the O.D. and simultaneously the I.D. to such a tolerance that will permit sliding of one tube into another tube. The back end of the tube is knurled, which extends or increases the O.D. a few thousands of an inch to prevent the tube from pulling through the swage. Contact between tubes are made by welding small one inch long springs below the knurl and at the end of each tube. Some antennae have twelve sections ranging from $\frac{1}{16}$" O.D. to 1" O.D.. length of section 16".

Preparation of Basis Metal for Electroplating

a. The basis metal, admiralty brass, is sandblasted with a very fine grit (120). This makes a physically clean surface for perfect adherence of any subsequent electrodeposit.
b. The sandblasted tubes are made chemically clean by cleaning the tubes cathodically in a commercial alkaline cleaner.
c. The tubes, after cathodic cleaning, are rinsed in clear cold running water.
d. Next, the tubes are cathodically pickled in a 10% solution of sulphuric acid. This removes any alkaline film that may have formed

on the tubes during the alkaline cleaning process and gives the brass surface a fine acid etch.

e. Rinse in clear cold running water.

f. At this point, the tubes receive a copper deposit from a cyanide copper electrolyte. This operation is absolutely necessary for perfect adhesion of the subsequent metal coatings.

g. After copper plating, the articles are rinsed in a separate clear cold running water, pickled in a 10% solution of hydrochloric acid and rinsed in special clean running water.

h. The brass tubes are now given an electrodeposit of nickel. The purpose of the nickel deposit is primarily to prevent hair line cracking of the subsequent chromium deposit. The nickel deposit also serves as a harder base for the chromium deposit, and thus helps one to get the full benefit of the hardness of the chromium deposit.

i. Rinse in a separate clean cold running water.

Chromium Electroplating

Chromium plating in this case is a very special process because we called upon electrodeposited chromium to produce a special blue-gray color that will match, be interchangeable and light fast.

When chromium plating, advantage is taken of the milky range of electrodeposition. By selective current density and temperature, one can plate the dull blue-gray color of chromium, for example; in this case, two chromium tanks are required containing four hundred gallons of chromic acid solution.

Composition of bath	*g/l*	*Oz./gal.*
CrO_3	250	33
H_2SO_4	2.50	0.33

The critical temperature is between 80° and 90° F., C.D., 150 Amperes 1 ft.^{2}, Volts 12.

The brass tubes containing the nickel deposit are chromium plated in tank #1 for twenty-two seconds at a C.D. 150 amperes 1 ft.^{2}, temperature 88° to 90° F. The tubes are then placed into a tank of clear running cold water. From the cold water tank, the tubes are chromium plated in tank #2. In this tank, the color of the deposit is controlled to a uniform blue-gray color by controlling the temperature between 80° and 85° F. and C.D. 150 amperes 1 ft.^{2}. Plating time, twenty-two seconds.

Note:—It is sometimes necessary to return the tubes to the color control tank for a second or a third time to get the color.

After chromium plating, the tubes are rinsed in cold running water, cleaned as cathode in a mild alkaline cleaner, rinsed and dried in a steam box. Finally the chromium deposit is greased with hot non-oxidizing petrolatum and wiped dry.

Tests

Reflectivity

1. Gray Chrome
2. Black Nickel
3. Corronizing
4. Ebonel C
5. Liver of Sulphur*
6. Black Anodizing*

Abrasive

1. Black Anodizing
2. Gray Chrome
3. Black Nickel
4. Ebonel C
5. Liver of Sulphur*

Salt Spray

1. Grey Chrome
2. Liver of Sulphur
3. Ebonel C*
4. Black Nickel*
5. Corronizing*

Electrical Conductivity

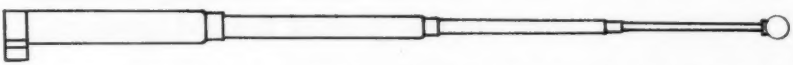
1. Grey Chrome
2. Black Nickel
3. Ebonel C
4. Corronizing
5. Black Anodizing*
6. Liver of Sulphur*

*Not satisfactory.

Required Apparatus

Two Motor Generator sets and two rectifiers supply the electricity for Electroplating. A total direct current of 6,000 amperes or 72 KW are required for the process.

1. Development for U. S. Signal Corps, Philadelphia, Pa. Area.
2. Electroplater, Electrochemist and Superintendent, Snyder Mfg. Company, Philadelphia, Pa.



A Telescopic Antenna partially extended. Full length is four feet.

PROCTOR AWARD

It was announced several months ago in the MONTHLY REVIEW that a Herminie Dorothea and Charles H. Proctor Award Fund was to be established by the Proctor family and that subscriptions were desired from the branches and other friends of Charles Proctor so that the annual award made at the convention could be perpetuated, thereby perpetuating the name of the Founder. The Executive Committee has decided not to make a "drive" or have an active campaign to solicit funds for this award, but they still believe that the Society should be interested in this fund and award. To date we have received one contribution from the Dayton Branch for $50.00, and we would like to call it to the attention of the other branches that we would be glad to receive their contributions to this fund.

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Unretouched photo shows the slight effect of constant handling over a period of 18 months on pieces treated in the Anozinc bath. Zinc plating identical on all pieces.

When zinc plated parts are finished in a Clear Anozinc bath they keep their sparkle and "zing"—as the photo above shows. It's an inexpensive anodic treatment that retains the appearance of new zinc plating—holds its lustre and attractive appearance—extends its resistance to corrosion and handling—*immeasurably.*

So why use a quickly tarnished finish when this fast, simple procedure will keep your zinc plate dressed up—at low cost? Use the Clear Anozinc bath to produce a finish that's an able pinch-hitter for chromium or cadmium—or wherever better appearance and a more durable zinc surface makes your products more serviceable. Write to the nearest office for further information, giving a brief outline of your application.

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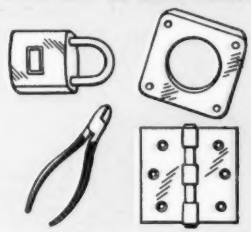

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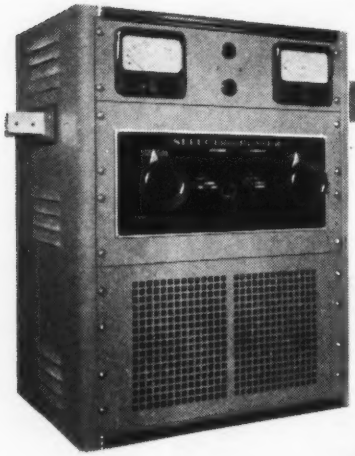

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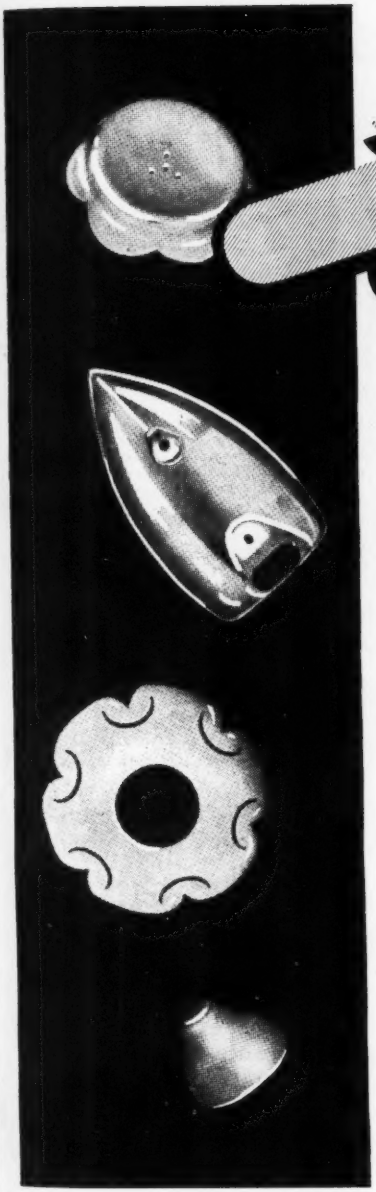

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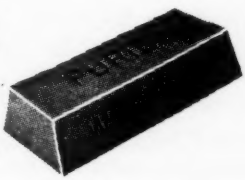

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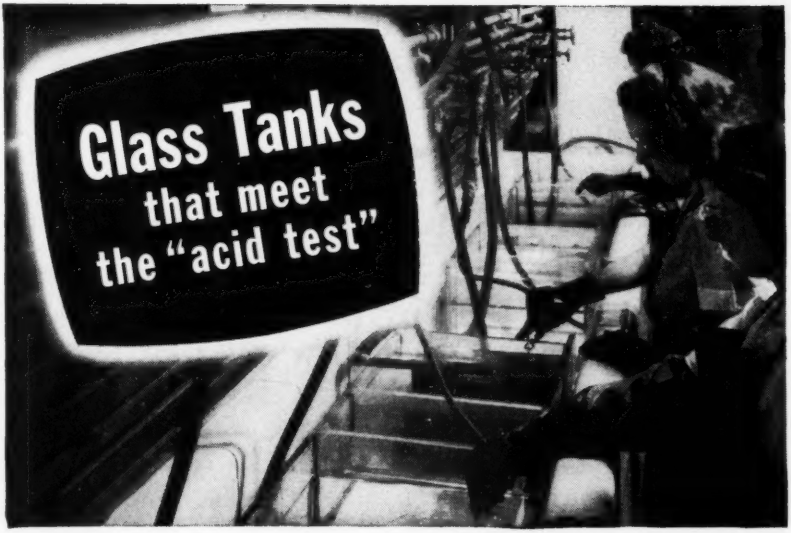
COMPLETE METAL FINISHING EQUIPMENT



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City..... State.....

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Use Darco for bright nickel, acid or cyanide zinc, cadmium, iron, copper, gold, silver.

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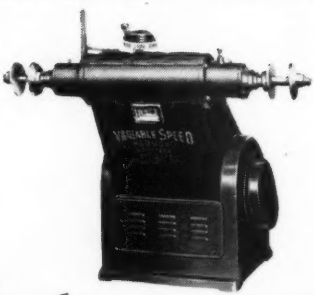

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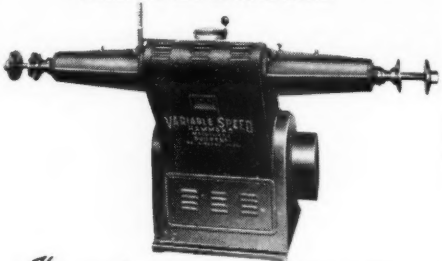

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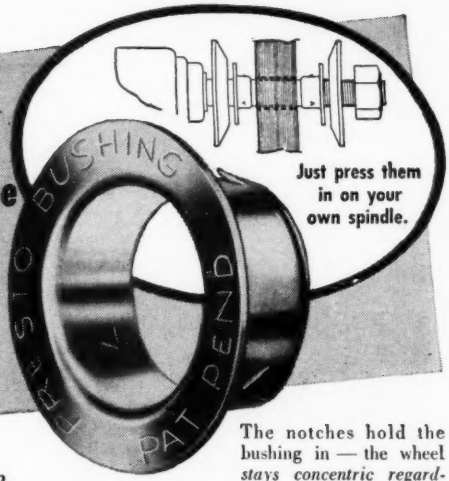

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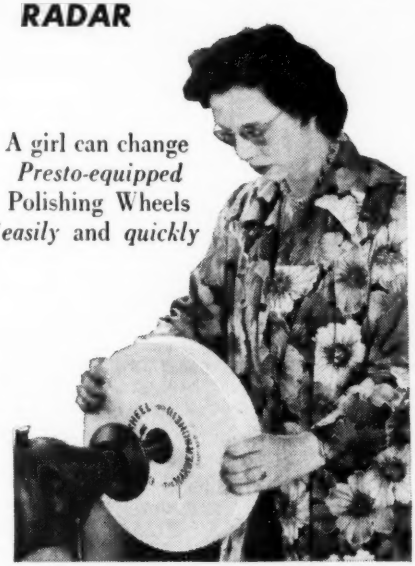

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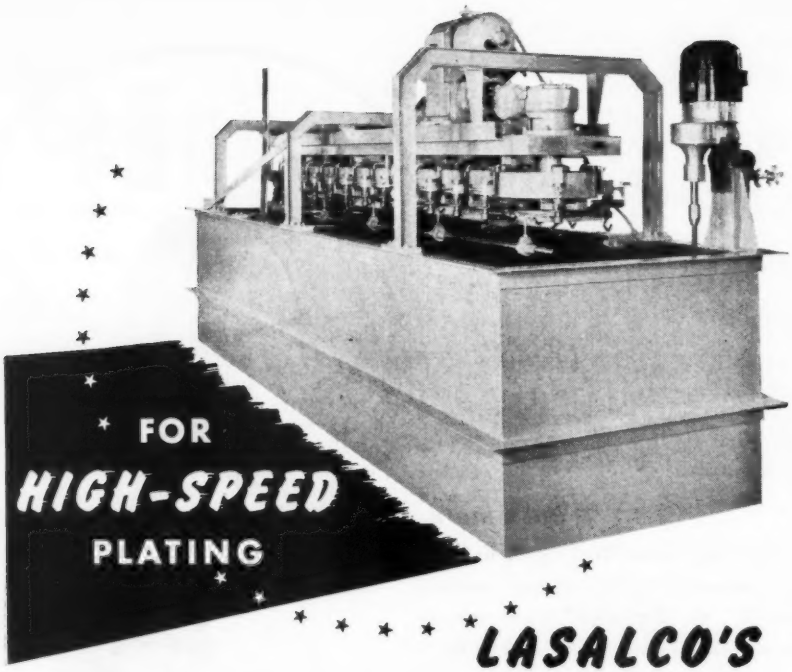

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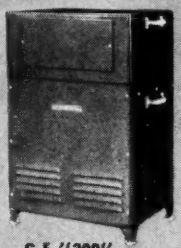

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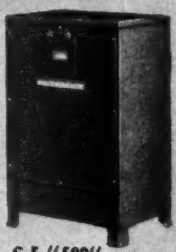

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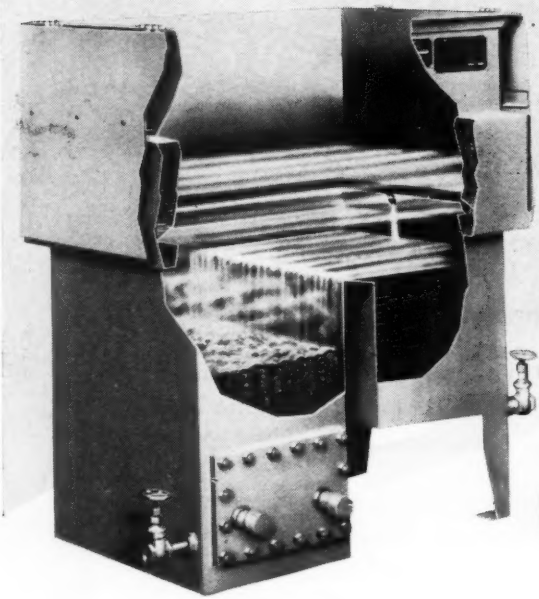

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ADHESION OF ELECTRODEPOSITS

BY B. F. LEWIS

THE subject of adhesion of electroplates has been a primary concern of platers, since the days when the only standard of quality was to keep the plating on the parts until they were sold. The relatively simple expedient of warming the nickel plating baths to reduce the strain in the electrodeposit was an innovation within the memory of many of us. Even this halting forward step was accompanied by the usual difficulties which beset the unorthodox craftsman when he deviates from traditional methods. With increased operating temperatures, the old pitch-lined tanks became inadequate; and about that time the industry became of age, in a scientific sense, adopting chemical control and instituting research programs in an effort to define some of the conditions associated with high quality plating.

Within the last twenty years, the subject of adhesion of deposits was studied by many investigators, with the aim of devising a quantitative method of measuring the strength of the bond between deposit and base metal. It is thus apparent that the importance of the problem has been long appreciated, and its importance increases with new applications of plating to uses other than ornamental.

These mechanical uses include:

1. Salvaging of worn parts by depositing metal selectively to replace metal worn away in use.
2. Application of wear-resistant coatings such as chromium, as an improvement over case-carburizing of steel.
3. Plating on parts which are to be machined or formed after plating.

Even on protective or ornamental coatings, the question arises as to whether the intimacy of the bond does not have a great influence on the tendency for corrosion to spread from any discontinuity in the plate. This is particularly significant on parts like automobile bumper bars, where mutilation of the plating is inevitable. As and when the plating receives a "wound" which extends through to the steel base, it is very desirable that subsequent rusting be confined to the exposed area. It is not uncommon to see steel accessories in out-door service develop corrosion failure, which starts at a very minor "lesion" in the plate, but which spreads rapidly underneath the adjoining plate, loosening the deposit, and exposing large areas of ferrous base metal to further electrolytic attack.

This problem was faced by paint-finishers and hot galvanizers as well as electroplaters. In the case of the organic coatings, a remedy was devised, in the form of chemical phosphate treatment to provide a non-metallic, inorganic paint-base. This phosphatizing is not a surface application, but rather a mutation of the surface, changing it from a metal to a non-metal, and serving as an insulator against progressive electrolytic corrosion. A somewhat similar treatment has been developed in the electroplating field, for bonding an electrodeposit to an aluminum base. In this case it has been found that if the aluminum surface is first anodized, a metal deposit can then be securely bonded.[1] Although the non-metallic film in this case may be only temporary, it serves the purpose, during the electro-deposition process, of preventing the adverse electrochemical reactions which would otherwise operate against satisfactory cohesion of the deposit and the aluminum base. Anodic treatments of steel, copper, zinc, and their alloys are used, and will be described elsewhere in tis discussion.

Hot dip galvanizing was mentioned earlier as a coating process which involves some problems in common with electroplating. While the primary function of the hot-dipped zinc coating is to offset electrolytic corrosion by the counter E.M.F. from the zinc-iron couple, the effective life of the coating is dependent on the intimacy of the bond between the zinc coating and the steel base. For this reason, the galvanizer makes every effort to insure actual fusion of the two metals, forming a zinc-iron alloy at the junction. This principle of promoting adhesion by fusion of coating and basis metal has been applied to electroplating, and will be described in detail later.

From this general discussion it will appear that the excellence of adhesion which is so desirable in a plater finish goes far beyond the traditional conception of a "clean" surface on the basis metal. In times past, peeling plate meant only one thing; grease or dirt left on

the surface. Now we know that perfect removal of grease is only one of several important steps in the proper preparation of the surface, if we are to obtain the high degree of adhesion required to meet modern standards of excellence.

What are these standards with respect to adhesion of electroplates? They are substantially the same as in the welding of metals; that is, the junction of the two metals must be as strong or stronger than the metals which are joined. It is entirely practical to achieve this value in plated coatings. This has been demonstrated by scientifically conducted tests on special test pieces. One of the most practical procedures consists of preparing a small steel cylinder with an insulating coating on one end. The other end is cleaned and prepared for plating by the method which is under test. The plating is then applied under controlled conditions, the thickness built up to at least .125 of an inch. Then the stopoff is removed and the plated end of the test piece is machined accurately to fit the physical testing fixture. By the application of controlled and measured pressure, the metal-to-metal bond is ruptured, and the cohesive strength is evaluated, in terms of pounds per square inch.[2] This method is dependent on precision machining and is therefore useful only where such facilities are available. No method has yet been devised for non-desructive testing for adhesion, but microscopic examination is one excellent method of checking the physical nature of the bond, and from this may be adduced its probable strength. The most commonly used test is that of simply bending or otherwise distorting a plated article until the plate is ruptured. If the plate is ductile and the bond is good, no amount of distortion will cause the plate to separate from the basis metal. Even this simple test is dependable only if the metal itself and all preparatory operations are identical with those which are used on the production parts in question.

Since it is not possible to determine the strength of the bond between the electroplate and the plated object without mutilating or destroying the object, it is obvious that the alternative is to utilize processing methods which will in themselves insure the desired adherent qualities. It is equally obvious that no generalized procedure can be specified to cover all cases. On the contrary, each case calls for careful considerations of all pertinent factors, foremost of which is, of course, the basis metal itself. Let us, therefore, consider each of the commonly plated metals individually, starting with the most common:

Steel

This generic term covers a multitude of various combinations of chemical and physical properties, and surface conditions. In fact, the

only thing specific about the term "steel" is that its principle constituent is iron. So it is necessary to qualify the term by breaking it down into more specific categories, such as alloy steel, stainless steel, high carbon and low carbon steel. The last named is, of course, the most commonly plated metal, but even in this single category we have to distinguish between hot-rolled and cold-finished sheets, not to mention forgings and castings. In many instances, cold-finished low carbon sheet steel is rolled under tension; that is, the strip is drawn through the rolling mill in the same manner in which wire is drawn through fixed dies. For this reason, the surface of the sheet is burnished to a somewhat lustrous finish, with the further result that the surface microstructure is distorted from its normal crystal pattern. This work-hardened condition reduces the chemical activity of the surface, limiting the action of acid dipping solutions. It has also been shown that this hard skin on the sheet has a greater affinity for hydrogen. But the most important effect of this burnished surface on adhesion is that the electrodeposit tends to build up in a columnar crystal form, normal to the surface. For example, if a cold rolled steel surface is plated first with copper, the nickel, the apparent adhesion will be likely to be poor, owing to the fact that copperplated on such a surface will have a low tensile strength, and will split when subjected to distortion.[3] Since many manufacturers wish to utilize bright mill finishes in the production of household electrical appliances, it is apparent that only deposits such as bright nickel should be used. These deposits build up without crystal formations, and are therefore more suitable for direct application on cold-rolled steel which has a bright finish. There is also a large volume of steel strip which is cold finished with a rough surface, usually described as "orange peel." This steel practically always requires abrasive polishing to produce a smooth surface for plating. Unfortunately, this polishing produces on the surface a condition similar to that produced by cold drawing at the mill. That is, the surface crystals of the steel are dragged out of shape by the polishing grit, producing, in effect, a work-hardened skin which is chemically resistant, is receptive to hydrogen penetration, and which induces the development of a weak microstructure in the electrodeposit. Since this surface effect is very thin usually less than the thickness of a single crystal of ferrite in the steel, it might seem a simple matter to remove the "skin" by chemical means. Actually, however, the usual acid pickling treatments are quite ineffective, since they produce other surface conditions which are as bad or worse than the original one. This is due to the fact that the acids attack the crystal boundaries preferencially, causing severe roughening of the surface; also, the iron carbide in the

steel dissolved by the acid is left as pickling "smut." The only means of chemically "skinning" the steel is by the use of anodic treatment in suitable acid baths. Under conditions which are favorable to the formation of atomic oxygen or the so-called per-compounds at the anode, the steel is dissolved away uniformly, leaving a microscopically plane surface in which the ferrite crystals are free to transmit their individual crystal orientation to the electrodeposit.

The anodic treatment usually recommended for this purpose, up to about 1940, consisted simply of a solution of sulphuric acid with various water contents. With this as a foundation, improved electrolytes have been worked out, using combinations ofsulphuric and phosphoric acids, plus other acids such as chromic or nitric. The sulphuric acid alone is difficult to operate, on account of its tendency to produce the so-called "periodic phenomenon" in which the anode becomes alternately active and passive. During the active interval, the steel is dissolved at a rapid rate and the surface becomes covered with carbide smut. During the passive period, the current flow drops to a low value, oxygen is set free on the anode, and the steel surface is perfectly clean. The improved electrolytes or anodizing baths incorporate the means of controlling the periodic action, so that the steel is continuously passive. This minimizes current consumption, at the same time insuring continuous production of atomic oxygen at the work surface.[4] The result is that just sufficient metal is removed to present a surface which is not only clean but is metallurgically ideal for the purpose of plating. While the current density required in the anodizing may be as much as 250 amperes per square foot, the time may be as short as one or two minutes.

Although anodic acid treatment is not as yet widely used on low carbon steel in preparation for protective and decorative plating, the process has a close parallel in the preparation of steel dies, gauges, etc. for the plating of hard chromium. In this case, it has long been the practice to anodize the surface of the part in a chromic acid electrolyte immediately prior to plating, in order to insure good adhesion. Since this is a definitely passivating treatment, it is obvious that the blame for poor adhesion which has long been ascribed to oxide films is not valid in all cases. particularly if the initial plate is applied under conditions which are favorable to reduction of the oxide film.

In plating nickel or copper on stainless steel, one patent covers the process of first anodizing, then plating in the same electrolyte, which contains only nickel chloride and hydrochloric acid. After the initial nickel plate, other metals such as copper may be deposited.

There is more than coincidence in the frequency with which anodic treatments occur in modern preparatory or cleaning operations. The widespread use of anodic cleaning in alkaline baths has been a great aid to better adhesion, especially in the field of cadmium and zinc plating. By using high concentrations and high current densities, good smut-removing properties can be obtained. Chemically, these baths utilize inorganic emulsifiers for grease removal. Under these conditions, the bath may have a relatively high surface tension, and this is conducive to effective action in removing smut anodically. In practice, such a bath will usually become contaminated in a short time by the introduction, on the work, of saponifiable fats used in fabricating or finishing the parts. The soaps thus formed are inimical to smut-removal and would ordinarily necessitate frequent replacement of the bath, if it were not for the fact that addition agents are now available which not only maintain the strength of the bath, but which also purge the bath of its accumulated dirt load. In this way the initial cleaning efficiency of the bath can be maintained at a uniform value for a long time. It should be born in mind, however, that the success of electrolytic cleaning is dependent on relatively high current densities, and this limits its effectiveness on very irregular shapes. Best results are obtained through high conductivity of the bath, rather than by means of high voltage.

Up to this point, this discussion has centered around the plating of steel. Let us look now at some of the non-ferrous metals, the most common of which is,

Brass

All of the principles mentioned in connection with steel are equally applicable to brass, with the exception that the brass is more readily reactive in the preparatory treatments.

Dull finishes on brass, such as the so-called "butler" or "satin" finishes, present more difficulty in obtaining good adhesion than highly buffed surfaces. This is due to the fact that the surface metal which has been mutilated by abrasives has a very low strength and thus provides poor anchorage for an electrodeposit. On the buffed surface, the finish is developed by a combination of abrasive and chemical action. The frictional heat of buffing promotes chemical reaction of the alloy metals with the organic acids present in the buffing compound. For this reason, the amount of cold-work on the surface is minimized, and good adhesion of plating is possible, without further severe chemical treatment. Here again, however, the best adhesion is obtained by anodic treatment in an alkaline bath which has a controlled etch-

ing effect. This etch may be accompanied by a slight but visible oxide film, which is readily removable by immersion in a low pH nickel solution. This latter solution may be the plating bath.

We now come to a part of our subject which has perhaps been more controversial than either steel or brass. That is,

Zinc Die Castings

These parts are produced under conditions which introduce metallurgical factors quite different from the rolled metals; yet in some respects, the problem of getting adherent electroplates is similar. For a long time, the presence of aluminum in the die-cast alloy was blamed for poor plate adhesion; but in recent years the die-casting metallurgists have been increasing the aluminum content, and eliminating copper. Instead of getting worse, plate adhesion has been improving; and it is now quite apparent that copper in the casting alloy was and is extremely detrimental to plate adhesion. This has been traced to the fact that the copper deposit, which is almost universally used as the primary coating on die castings, adheres to the zinc alloy base by virtue of diffusion or amalgamation. Anything which interferes with this process, either at normal temperature or under heat, adversely affects the adhesion. Furthermore, when copper is present in the casting in excess of about .2%, the amalgam layer is relatively weak, and under any stress, such as heating, will break readily. Under ideal conditions, with the copper content of the casting at a very low value, the copper plated casting may be heated until the copper deposit is entirely converted to the amalgam without separation.

This principle of adhesion by means of an alloying reaction at the juncture of plate and basis metal has been suggested by several investigators on steel and brass, although of course the extent of the diffusion is much less than on die castings. An interesting application of this principle is in the porcelain enamelling process, where the coating is formed by applying a layer of powdered glass on the clean steel surface and then vitrifying the glass at its melting temperature. In order to improve the adhesion of the vitreous coating, it has been found effective to first coat the steel with a thin layer of nickel. At the firing temperature, the nickel reacts with the underlying steel and the glass, forming a fusion zone which has great strength on cooling. In line with these facts, it is not unlikely that in the near future, scientific heat treatment may be utilized to promote adhesion of electrodeposits.

In any discussion of adhesion, consideration should be given to the type of plating failure where the deposit, such as nickel, peels off

in layers; that is, the failure occurs within the deposit, rather than at the surface of the basis metal. This type of peeling due to lamination of the deposit has been rather frequent in connection with conveyor type plating equipment. In a large unit, with many cathodes fed by sliding contacts, the current may, under certain conditions, be momentarily interrupted on one or more of the cathodes, or racks, or even on individual parts. During the interval when these parts are neutral in close proximity to strongly charged anodes and cathodes, they become bi-polar. When contact is re-established, the work areas which were momentarily anodic will continue to receive the deposit, but the top layer will not be strongly adherent to the original deposit. This is one instance where anodic treatment is definitely detrimental. The inference is that every precaution should be taken to insure that, once the plating operation has been started, no interruption can occur. This places increased responsibility on the designers of racks and plating machines, to provide not only adequate conductor capacities, but also contact arrangements which can be readily cleaned and maintained in good working order.

Another common type of plating failure is the so-called "weather blister." Reference has been made earlier in this discussion to the accelerating effect of poor bond on this type of failure. As for its specific cause, however, there is conclusive evidence that the failure starts, not at the base of the plate, but at the weather side. That is, the blistering is a secondary stage, following perforation of the plate by atmospheric corrosion. The nucleus or starting point for the perforation may be a particle of dirt on the surface or co-deposited in the plate. In the presence of a moisture film electrolyte, the particle forms an electrolytic couple with the plate, and the latter is eroded progressively until the microscopic cavity cuts through to basis metal. Then the electrolytic action reverses, the basis metal eroding at a rapid rate. The corrosion spreads radially from the initial perforation and the corrosion products force the plate into the form of a blister, with an open crater through which the corrosion products continue to emerge. This process has been observed on automobile parts, in normal service, and has recently been substantiated by tests on sheet nickel in the salt spray. These tests showed that nickel sheets which were initially free of porosity developed small perforations in the salt spray. Since the test was independent of all factors such as basis metal imperfections or cleaning operations, the inference is clear that this type of failure must be combatted at the true cause. The tendency has been to increase the thickness of plate, since this greatly postpones penetration and the visible forms of corrosion. Extreme cleanliness in the plating baths should

also contribute to prevention of this type of failure. Most important, however, is frequent cleaning and waxing of the plated parts in service, to remove the primary cause.

Conclusions

Good adhesion throughout the service life of plated parts is promoted by the following factors:

1. Surface of the basis metal must be free of loose smut or other foreign matter.
2. Surface of the basis metal must be finished by methods which remove, rather than form, a layer of cold-worked metal. This can be accomplished mechanically by buffing rather than a polishing; or electrochemical treatment may be used to produce a surface in which the normal microstructure of the basis metal is exposed with a plain, bright surface.
3. The electrodeposition, once started, must not be interrupted until the total desired thickness of any given coating has been applied.
4. Weather blistering may be minimized by observing the foregoing factors, plus thorough purification of plating baths, adequate thickness, and subsequent care and cleaning of the plated parts.

---

*Technical Director, Northwest Chemical Co., Detroit.

1. William J. Travers, American Electrochemical Society, May, 1939.
2. Ollard, E. A., Trans. Faraday Society, Vol. 21 (1926)
3. Hothersall, A. W., Proc. American Electroplaters Society, June, 1939.
4. See foot-note 3.

32nd. PROCEEDINGS

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COLORIMETRIC METHODS AS APPLIED TO THE ANALYSIS OF ELECTROPLATING BATHS

D. Gardiner Foulke, Ph. D.

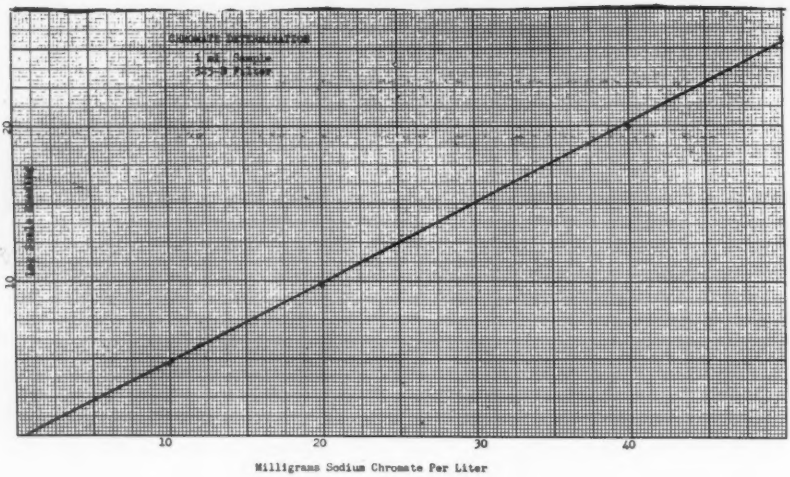
III. Chromium

AFTER completion of the article on the determination of traces of nickel in electroplating baths,[1] in which was discussed the analysis of chromic acid baths for nickel (this being a special problem peculiar to our laboratory), it was suggested that it would be of greater general interest to describe a method for the determination of relatively small amounts of chromic acid in nickel and copper baths, particularly in view of the decrease in efficiency and peeling caused by the presence of chromate ions in these baths as shown by Beckwith[1] who recommended sodium hydrosulfite to reduce the chromic acid to chromic ions. Inasmuch as such a method had been developed, it is hereby presented for the consideration of those confronted with this problem.

The method selected is known as the diphenylcarbazide method[2] which is extremely sensitive as well as capable of giving results of high reproducibility. Moreover, hexavalent chromium is the only element giving a characteristic violet-red coloration with diphenylcarbazide, and, consequently, this method may be employed for both copper and nickel baths without resorting to any special separations as shown in Tables II and III.

The procedure is extremely simple and is as follows:

1. Pipette 10 ml. of the nickel into a 100 ml. volumetric flask and dilute to the mark.
2. Place 10 ml. of the diluted sample in a 100 ml. volumetric flask.
3. Add the following:
   a. Three milliliters 6 N H_2SO_4 and dilute almost to volume with distilled water.
   b. Two milliliters of the diphenylcarbazide reagent (250 mg. diphenylcarbazide dissolved in 50 ml. acetone and diluted to 100 ml. with water).



4. Make to volume with distilled water and compare in a photoelectric colorimeter using a green filter (525-B) and a blank consisting of the reagents (a and b) diluted to 100 ml.

Using a standard sodium chromate solution the data found in Table I were obtained, which when plotted give the curve shown in Figure I. To find milligrams per liter of chromic acid multiply by 0.617.

Table I

Calibration of the Electrophotometer

Scale A Reading	*Mg/L* Na_2CrO_4
4.75	10
9.75	20
20.00	40
25.71	50
48.7	100

In order to determine the interference which might result from the nickel color various concentrations of nickel were studied as shown in Table II. For nickel concentrations of the order of two normal or 8 ounces per gallon these data show that no interference is encountered. Even when the nickel-chromate ratio becomes five times that resulting when the procedure above is used for a 2 N nickel bath, the chromate content was found to be as accurate as generally required. However, by substituting for the blank described above, a blank consisting of 10 ml. of the diluted nickel bath and 3 ml. of the 6 N sul-

furic acid diluted to 100 milliliters, the results obtained were surprisingly accurate as shown in Table II.

Table II

The Determination of Chromate in Nickel Plating Baths

Nickel Bath	*$MgNa_2CrO_4$ Added*	*Average Reading*	*Mg/1. Na_2CrO_4 Found*
A	20	9.8	20
A	20	9.5	19.3
A	10	4.9	10
A	10	4.7	10
B	50	25.3	50
B	50	25.5	50
B	25	11.9	24.8
C	50	27.0	52
C	50	26.9	52
C*	50	25.3	50
C	25	13.5	27
C	25	13.5	27
C*	25	12.4	25
C*	25	12.3	25

Bath A: One normal in nickel.

Bath B: Two normal in nickel.

Bath C: Nickel concentration at final dilution equivalent to a bath ten normal in nickel.

*A blank containing an equivalent amount of nickel was used.

Inasmuch as copper in acid solutions, in the dilutions employed, gives a green-blue tint somewhat similar to nickel solutions the procedure outlined above was followed with the excellent results shown in Table II.

Table III

The Determination of Chromic Acid in Copper Bath

Copper Bath	*Mg/1 Na_2CrO_4 Present*	*Mg/1 Na_2CrO_4 Added*	*Average Reading*	*Mg/1 Na_2CrO_4 Found*
A	?	0	4.6	9
A	9	50	29.7	58.5
A	9	40	24.6	48.5
A*	9	50	29.5	58.0
A*	9	40	24.6	48.5

*A blank containing an equivalent amount of copper was used.

References

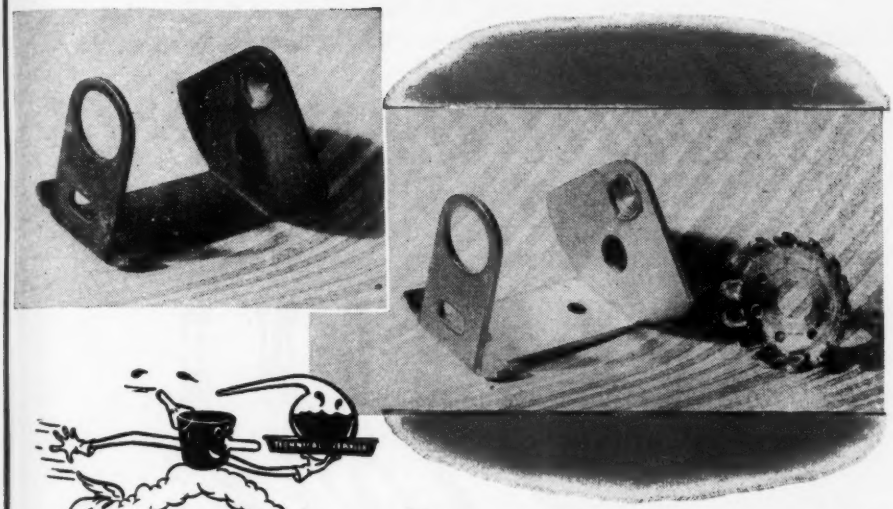
The above method can be applied to cyanide copper baths as well as the acid copper bath for which the results shown in Table III were obtained. Here some reduction may occur in fuming out the cyanide with sulfuric acid. However, the total chromium may be obtained by oxidation of the chromic ions by the conventional NaOH — Na_2O_2; or better by the addition of a solution of ammonium persulfate to the unknown which is .5 N with respect to sulfuric acid, followed by a ten minute boil in the presence of silver ion. If both chromic and hexavalent chromium concentrations are required, the use of the persulfate oxidation provides a simple method for obtaining information as to the total chromium and a simple method for obtaining information as to the total chromium and consequently the chromic concentration by difference. No study of the analysis of rochelle copper was made. It is suggested probably a careful perchloric acid treatment will be necessary to eliminate the reducing effect of the tartrate ion.

The diphenylcarbazide method gives highly accurate results when employed to determine small amounts of chromic acid if proper precautions are taken such as the elimination of reducing substances in the sulfuric acid by the addition of permanganate to a very faint pink color,[3] the adjustment of the pH in the final solution to approximately .3 N and care to have all apparatus rinsed of any trace of the common laboratory cleansing agent (sulfuric acid-sodium dichromate solution). The precision attainable by this method suggests too that fairly large concentrations of chromic acid might be determined, within the accuracy of the instrument employed, by resorting to large dilutions. Along this line a study of the application of this method to the analysis of chromic acid baths is being undertaken in our laboratory.

1. Beckwith, M. M., Transactions of the Electrochemical Society, **80**, 362 (1941)
2. Koenig, P., Chem. Ztg. **35**, 277 (1911)
3. Colorimetric Determination of Traces of Metals, E. B. Sandell, p. 193 (1944), Interscience Publishers, Inc.

CONVENTION CANCELLED

Application to hold the 1945 Convention at Pittsburgh was denied by O.D.T. in accordance with their policies. Further details will be announced in forthcoming issues of the Review.



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THE FUNDAMENTALS OF CHEMISTRY FOR ELECTROPLATERS

PART XVI

SOLUTIONS AND SOLUBILITY

Samuel Glasstone, D. Sc. Ph. D.

The Nature of Solutions

IF a small quantity of solid such as sugar or table salt (sodium chloride) is added to water, it will be observed that the particles of solid gradually disintegrate and eventually disappear, leaving a perfectly clear liquid. The sugar or salt is said to "dissolve" in the water, and the resulting liquid is known as a "solution." The substance which dissolves, that is the sugar or the salt, or other material which behaves in a similar manner, is referred to as the 'solute," while the water is the "solvent." A solution is thus described as a homogeneous, that is, completely uniform, mixture of the solute and solvent. In a true solution the particles of the dissolved substance, the solute, are so small that they cannot be separated by the finest known filters, nor can they be seen in the most powerful microscope. In fact, there are good reasons for believing that the solute has been broken down into such fine particles that they are actually single molecules, these being the smallest units of the substance that can possibly exist (see Part III, MONTHLY REVIEW, Feb. 1944). The essential characteristic of a true solution is, therefore, that it consists of molecules of one substance, the solute, distributed uniformly among those of another substance, the solvent.

Saturated Solutions and Solubility

Substances like sugar, sodium chloride, and many chemicals familiar to the electroplater, such as nickel sulfate, potassium cyanide, chromic acid, etc., which dissolve fairly easily in water, are said to be "soluble" in water. On the other hand, materials which do not dissolve are "insoluble;" for example, sand, copper, mercury, etc., are insoluble in water. Between the relatively soluble substances mentioned above and those which are almost insoluble, there are many compounds of varying degrees of solubility. For nearly every substance, there is a

definite limit of solubility which depends on the temperature, and the nature of the solvent. For the present it will be supposed that the solvent is water. When a certain quantity of water has dissolved as much as it possibly can of a given solute at a specified temperature, the resulting solution is called a "saturated solution." If the solution contains less of the solute than the saturation amount, so that it can still dissolve more, it is said to be "unsaturated." A given solution may be saturated with respect to one solute, and still be unsaturated with regard to another; however, as a general rule, the presence of one solute will have some effect on the amount of the other which can be held in solution.

The quantity of solute which has been dissolved by a specified weight or volume of the solvent, e.g., water, when the solution is saturated, is referred to as the "solubility" of that solute in the given solvent. It represents the maximum or limiting amount of the solute which can be dissolved by the particular quantity of solvent at a certain temperature. The solubility of any substance depends on the temperature; as a general rule, the solubility of a solid solute increases as the temperature is raised. Both the actual value of the solubility and the variation with temperature depend on the nature of the solute and solvent. Two examples, of the solubilities of sodium chloride and nickel sulfate, expressed in grams of substance dissolved by 100 grams of water, at various temperatures, are given below:

Temperature	0°	30°	50°	70°	100°C.
Sodium Chloride	35.7	36.3	37.0	37.8	39.8
Nickel Sulfate	27.2	42.5	50.1	59.2	76.7

It will be seen that at low temperatures the solubility of sodium chloride is the greater of the two, but at higher temperatures nickel sulfate is the more soluble. The solubility of the latter thus increases much more rapidly with increasing temperature than does that of sodium chloride.

Purification by Recrystallization

An important aspect of the variation of solubility with temperature is the ability to purify substances by the process of "recrystallization." If a saturated solution, for example, of nickel sulfate, is made at about 100°, there will be present 76 grams of the salt to 100 grams of water. Upon cooling to 30°, the saturated solution contains only 42 grams to 100 grams of water, and the remaining 76 — 42, i.e., 34 grams, will separate out in the solid crystalline form. If the original salt contained a moderate amount of soluble impurities, these will remain in solution, which is still unsaturated with respect to them.

The crystals obtained in the manner just described are thus considerably purer than the starting material. The latter has thus been purified by recrystallization.

It should be noted that for a substance like sodium chloride, the solubility of which varies little with temperature, purification by recrystallization is not very practical. The figures given above show that the solubility increases by less than 4 grams per 100 grams of water between ordinary temperatures and 100°. It would be necessary, therefore, to use large volumes of solution in order to obtain appreciable amounts of solid upon cooling the saturated solution. In cases of this kind a modified recrystallization procedure is often used. A saturated solution of the substance is prepared at ordinary temperatures, and then something is added which causes the solubility of the solute to decrease. The excess of the latter then separates out in the form of relatively pure crystals. Liquids such as alcohol or acetone are sometimes used to decrease the solubility of a salt in water, although with sodium chloride the same effect is produced by the addition of hydrochloric acid to the solution. This is the method almost invariably used for the purification of sodium chloride in the laboratory. On the large scale in industry, however, the common practice is to make a saturated solution, and then to evaporate off some of the water by heating. Since there is now less water available to act as solvent, some of the salt must separate out. The impurities, with respect to which the solution is still unsaturated, remain in the liquid.

Range of Solubility

The two examples given above, namely sodium chloride and nickel sulfate, are of "fairly soluble" substances. A few compounds, such as sodium and potassium hydroxides, calcium chloride, etc., are even more soluble; these are said to be "very soluble." Other substances, such as boric acid which is soluble to the extent of only 4.8 grams per 100 grams of water at 20°, are referred to as "moderately soluble," while at the extreme there are the very slightly (or "sparingly") soluble substances, such as silver chloride or silver cyanide, of which less than a thousandth part of a gram will dissolve in 100 grams of water at ordinary temperatures. In these latter cases, however, the solubility can be greatly increased by the addition of certain substances, such as ammonia or a cynide solution, which combine with the silver chloride or cyanide and cause them to pass into solution.

If a solution, irrespective of whether it is saturated or not, contains a large amount of dissolved substance, it is often called a "concentrated" solution. On the other hand, if it contains only a small quantity of solute, it is referred to as a "dilute" solution. There is no

definite line of demarcation between concentrated and dilute solutions, and so the distinction is somewhat vague, but it is nevertheless useful. If a solution contains about 20 per cent or more of solute, it would be regarded as concentrated, but if there were something like 5 per cent or less it would be thought of as being dilute. It must be remembered, however, that these figures are intended only as a very rough indication of what is a concentrated and what is a dilute solution.

Types of Solution

Although the foregoing discussion has referred particularly to solutions of solids, such as salts, in water, many other types of solution are known. The solute may be liquid or gas, as well as solid, and the solvent may be any suitable liquid. For the electroplater, water is the most important solvent, since it is capable of dissolving a large number of salts, acids and bases, such as are used in plating. Nevertheless, much experimental work has been done on the deposition of metals from other solvents, generally referred to as "nonaqueous solvents." It is not improbable that practical methods for plating from nonaqueous solutions of such metals as aluminum, magnesium and manganese, which do not separate easily from aqueous, i.e., water, solutions, will be developed in the future. It is important to realize, therefore, that solutions of salts in liquid solvents other than water are known to the chemist, although they have so far had little industrial application.

Most solids, no matter what their chemical nature, have a limited solubility in water or other liquid solvent. Many liquid solutes, such as ether and chloroform, also have a limited solubility in water, but some liquids, e.g., alcohol or acetone and water, are completely miscible with one another in all proportions. There is consequently no limit to the solubility of alcohol or acetone in water. Gases, like solids and many liquids, possess a definite limiting solubility, depending on the temperature; thus, concentrated hydrochloric acid is really a saturated solution of hydrochloric acid gas (hydrogen chloride) in water. However, there is one important difference between the solutions of gases and those of other substances: the solubility of a gas in water (or other liquid) *decreases* as the temperature is raised, whereas for nearly all other substances the solubility increases. It is because of this decreasing solubility that it is possible to remove a dissolved gas, e.g., air, by heating a solution. Although solutions of liquid and gaseous solutes are of considerable importance and interest, the subsequent articles will deal more particularly with solutions of acids, bases and salts in water, for these are of the greatest concern to the electroplaters.

INDUSTRY NEWS

Obituary

The Indianapolis Branch of the American Electroplaters' Society regrets to announce the loss of one of its members, Lt. Joseph B. Schwartzkopf.

The Navy Department informed his parents by telegram that Joseph (Joe) Schwartzkopf, USNR, had died November 23, 1944 in the service of his country.

Joe was a graduate of Indiana University having received his A.B. in 1936, and his Masters in 1937. At the University he was a member of Phi Kappa Psi, Alpha Chi Sigma, Phi Lambda Upsilon, Phi Eta Sigma, Kappa Kappa Psi, Blue Key, Senior Siwash Committee, and Phi Beta Kappa.

For a time he worked at Noblitt Sparks Industries and in September, 1941 was elected to Associate membership in the Indianapolis Branch of the American Electroplaters' Society.

In January, 1942, Joseph Schwartzkopf entered the Navy as an Ensign. Following his training at Fort Schuyler in New York, he was stationed for a time at the Naval Ordnance Plant at Indianapolis. After some additional training, he was sent to the Pacific area as an Aviation Gunners Officer, and had been in the Pacific about sixteen months at the time of his death.

The Indianapolis Branch of the American Electroplaters' Society wish to share their sympathies with his parents and friends and hope he will ever be remembered as a man who gave his life that we may work and live in a country where free enterprise and democracy thrive.

Boston Branch 10th Annual Educational Session

The technical session will open promptly at 1:30 P.M. in the Georgian Room of the Hotel Statler, Boston, Mass., March 3, 1945 with George B. Hogaboom presiding. The speakers of the afternoon are Mr. R. R. Bair, of E. I. Du Pont de Nemours & Co., Niagara Falls Laboratory — "Recent Developments in Cyanide Zinc Plating;" Dr. Ralph Lee of Public Relations Department, General Motors Corp., Detroit, Mich. — "Human Engineering;" Mr. Arthur W. Logozzo, of Nutmeg Chrome Plating Co., Hartford, Conn. — "Hard Chromium Plating."

The banquet will be held in the Georgian Room of the Hotel Statler with a fine show, dancing and door prizes. This "Gala Event" celebrates the 25th year of active participation by the Boston Branch in the A.E.S.

Agruss To Battelle

Dr. Bernard Agruss, research chemist, has joined the staff of Battelle Institute, Columbus, Ohio, where he will be engaged in electrochemical research.

A former associate of the American Smelting and Refining Company, Perth Amboy, N. J., Dr. Agruss holds Bachelor of Science and Master of Science degrees from Washington University and a Doctor of Philosophy degree from the University of Cincinnati. He is a member of the American Chemical Society, the Electrochemical Society, Tau Beta Pi, and Sigma Xi.

American Chemical Paint Appoints Bricker & Andes

Bricker and Andes, 316 Atlantic Ave., Brooklyn, N. Y., have been appointed Sales Agents and Distributors of the Inhibitors and Metal Working Chemicals for the American Chemical Paint Co. of Amber, Pa., to expedite the serv-

ice and supply these materials to the metal working industries in the New York City Metropolitan Area.

The territory covered by Bricker & Andes consists of the following counties in New York State — Manhattan, Kings, Queens, Richmond, Bronx, Nassau, Suffolk, Westchester and Rockland. In New Jersey: Hudson, Essex and Union.

The experience of the Technical Service of Bricker and Andes will supplement the cooperation of the American Chemical Paint Company's Technical Staff and Laboratories in the solution of chemical metal working problems.

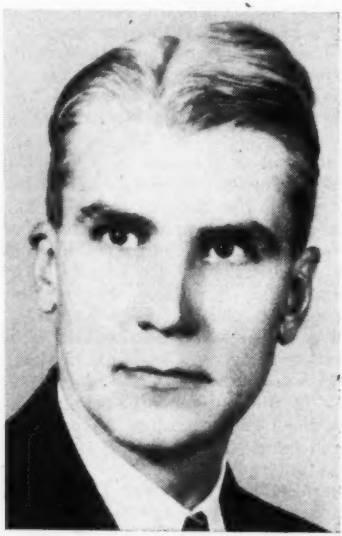
A. O. THALACKER

Detrex Corporation Advances Two Executives

A. O. Thalacker has been elected to Vice-President and General Manager of Detrex Corporation, Detroit, manufacturers of industrial cleaning equipment, chemical cleaning compounds, drycleaning machines and oil-extraction plants. Mr. Thalacker joined the organization in 1937 and since that time has held the executive positions of Assistant Secretary and Secretary, which office he held prior to his recent promotion.

Originally in charge of all domestic and foreign patent matters, Mr. Thalacker has been responsible for the organization and development of the company's legal division. Research activity in the field and laboratory has been considerably expanded by Mr. Thalacker in the company's Industrial and Alkali divisions, and the two newer divisions, Drycleaning and Oil-extraction.

E. W. Allison, who has been in the legal department of the firm since 1941, is now Secretary. In his new office, Mr. Allison has supervision over the legal and personnel divisions of the firm. Through his efforts, an efficient personnel department was established and particular emphasis given to first aid and care of Detrex employees in offices as well as shops.



JOSEPH S. BRADY

Optimus Detergents Company Adds to Staff

The Optimus Detergents Company, Matawan, N. J., manufacturers of metal cleaners, and industrial cleaning materials for production and maintenance use, announce the appointment of Joseph S. Brady as Technical Supervisor, and A. C. (Neil) Daly as Technical Field Representative.

Mr. Brady has had a long active career in industry and particularly in the field of metal cleaning which has made him thoroughly conversant with all its details and problems. A graduate of the

NEIL DALY

University of Rochester, he has also taken special studies in chemical engineering at Lehigh University. He was formerly with the Eastman Kodak Company in their Technical Chemicals Department. Following that, he spent several years with Oakite Products, Inc., as Research Chemist.

Mr. Daly has also had a long practical and technical experience in the metal cleaning field. A graduate of Rutgers University, he was formerly with Wright Aeronautical Corp., Paterson, N. J., as Process Engineer on production metal cleaning. More recently he has been with the Magnus Chemical Company as Consultant on metal cleaning problems. For several years, Mr. Daly was Technical Field Representative for Oakite Products, Inc.

Mr. Brady will be in charge of the Optimus Technical Laboratory. Mr. Daly will be assigned to special technical work in the field. Both will also work in conjunction with the Optimus affiliate, Optimus Equipment Company of Matawan, N. J., manufacturers of metal cleaning equipment and dryers.

Foulke to Foster D. Snell Inc.

Dr. D. Gardner Foulke, recently chief chemist for the Garfield Division of Houdaille-Hershey Corporation, has joined the staff of Foster D. Snell, Inc. as Director of the Analytical Department.

Dr. Foulke received his B.S. degree from Juniata College, the M.S. and Ph.D. degrees from Rutgers University. He served as Instructor in Analytical Chemistry at Rutgers University and as Assistant Professor of Analytical and Organic Chemistry at Beaver College. Subsequently he entered the industrial field as analytical and research chemist with A. K. Graham Associates, leaving to become Assistant Chief Chemist in charge of the Analytical Laboratories of Republic Steel Corporation. In collaboration with Frank Schneider, Dr. Foulke has published a series of articles in Industrial and Engineering Chemistry, Analytical Edition, on "The Micro-Technique of Qualitative Organic Analysis." Currently a group of articles on "Colorimetric Methods as Applied to Electroplating Baths" is appearing in the MONTHLY REVIEW of the American Electroplaters' Society.

In his new position, Dr. Foulke will have complete charge of analytical work with the responsibility of developing necessary technics for new and unusual types of analyses.

T. W. Kirby Passes

Mr. D. R. Hay announcing the passing of Mr. T. W. Kirby has written as follows:

It is with deep regret that we announce the death of Mr. T. W. Kirby.

Mr. Kirby was President of our Company for the past 10 years. He guided it successfully and in so doing won friendship and respect. Those of us who have been favored by being closely associated with him, will miss him sorely.

It was his desire that we carry on. We, who were his associates, will endeavor to operate the A. T. Wagner Co., on the high standard that has characterized it during the past 29 years; first under its founder, Mr. A. T. Wagner; and for the past 10 years under Mr. T. W. Kirby.

Detrex Celebrates 25th Anniversary at Regional Meetings

Detrex Corporation, Detroit, Michigan, manufacturers of alkali cleaning compounds, industrial cleaning equipment, dry-cleaning machines and oil-

R. A. EMMETT

extraction plants is holding a series of meetings in the company's various sales areas. These meetings have a dual purpose; to mark the beginning of the Corporation's 26th year in business, and to cover present and contemplated developments in the manufacture of various Detrex products.

The first of these meetings was held in Detroit on January 12th, 1945, the anniversary of the founding of the company in 1920. Members of the Detrex organization in the Eastern region met at Hershey, Pa. on January 19 and 20. Western, Pacific and Southern regions have planned early meetings in honor of the occasion. To commemorate the anniversary, recognition is being given in the form of pin awards to all employees having five or more years of continous service with the company.

At the Detroit meeting, Robert A. Emmett, President and Chairman of the Board and a member of the original partnership which started the business, traced the history of the company from the days when all manufacturing operations were performed in a small garage to the present time with the corporation occupying more than 120,000 square feet of floor area in its modern Detroit plant. He also announced the election of two Detrex executives to new posts. A. O. Thalacker becomes Vice-President and General Manager, and E. W. Allison is now Secretary of the Company. Other officers of the firm include C. F. Dinley, Vice-President in Charge of Engineering and Manufacturing; G. E. Powers, Treasurer; and W. W. Davidson Vice-President and General Sales Manager.

John D. Kershaw Joins H-VW-M

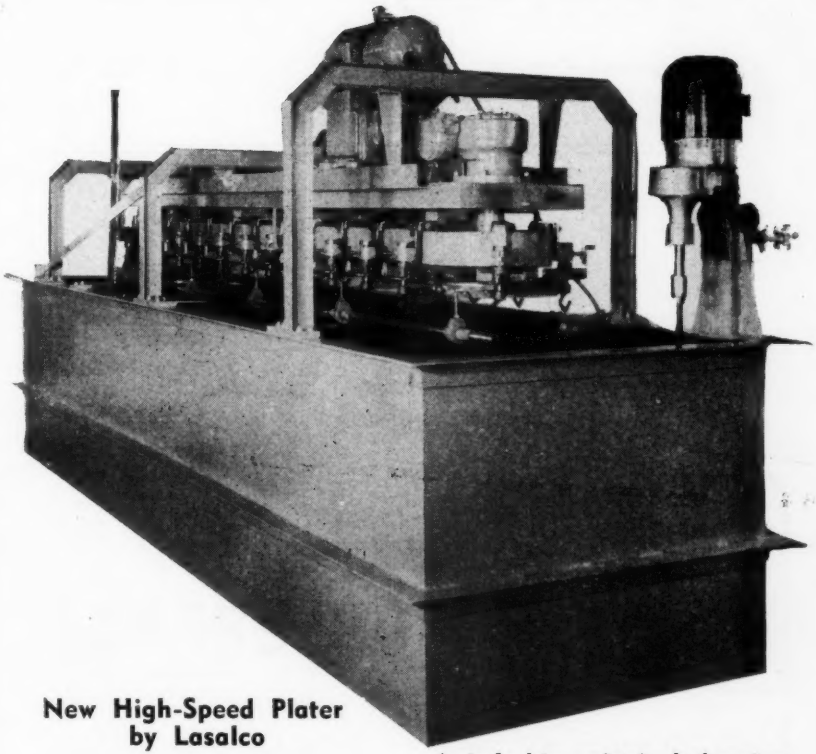
The Hanson-Van Winkle-Munning Co., Matawan, N. J., manufacturers of electroplating equipment and supplies, announce the assignment of John D. Kershaw, Jr., as Field Engineer.

Mr. Kershaw attended the Crane Junior College of Chicago and subsequently received the degree of Bachelor of Science in Chemistry at Illinois Institute of Technology. Prior to the war he was head of the laboratory of the P. E. Madden Company of Chicago, Ill., and later, was a field engineer located in Milwaukee for the same company. Since the war and until recently he was Supervisor of Plating in Aviation Div., Stuedbaker Corp., South Bend, Ind.

Mr. Kershaw will have his headquarters in the Detroit office of the H-VW-M Co., at 2842 West Grand Blvd., and his services will be available to manufacturers in that district who are interested in electroplating.

J. D. KERSHAW

NEW *Equipment Materials Supplies*



New High-Speed Plater by Lasalco

A new Reciprocating type Semi-Automatic high-speed plating machine with rotating cathode has just been developed by Lasalco, Inc., St. Louis. Put in service within the past few weeks with a leading aircraft plant, this new machine utilizes man-hours more efficiently, and promises notable cost reductions because of its ability to maintain the even quality of solution at the cathode, its construction to prevent the corrosion of operating parts, and its adaptability for plating inside surfaces of bearings and other similar parts, large and small.

A single drive maintains both reciprocating action and chain travel, with the chain and mechanism submerged in oil to prevent corrosion. This latter mechanism is almost entirely enclosed. Plating tank can be provided with agitator boot for either a single type of solution agitation, or a combination of several motions.

The machine can be furnished in any size to suit specific requirements or conditions.

For complete description, illustration, and information regarding special applications write Lasalco, Inc., 2818 La Salle St., St. Louis 10, Missouri.

Zinc Brite Announced by Sulphur Products

Sulphur Products Company, Inc., Greensburg, Pa., announce ZINC BRITE, a new product for purifying zinc solutions.

Manufacturer says the product can be poured or sprayed into zinc plating solutions in a ratio of 1 ounce to 30 gallons. The product will precipitate heavy metal impurities and thus help produce lustrous zinc deposits. The plating operation need not be interrupted when this product is added to the plating solution.

National Carbon Announces New Bulletin

This 20-page bulletin describes and illustrates a wide variety of carbon, graphite, and "Karbate" products manufactured by National Carbon Company, Inc. for use in the Chemical, Metallurgical, Mechanical, Electrical and other industries. The products are presented in sequence as applying to each of these industries and there are many charts and tables covering the physical and chemical properties, together with application and operational data on these products.

Situation Open

Combination Plating Chemist and Salesman. Give full details first letter. Confidential. Write Box #25. MONTHLY REVIEW.

1945

A.E.S

ANNUAL CONFERENCE

Pittsburgh will endeavor to expedite registrations—both hotel and conference—for your convenience.

PITTSBURGH IN '45

AMERICAN ELECTROPLATERS SOCIETY

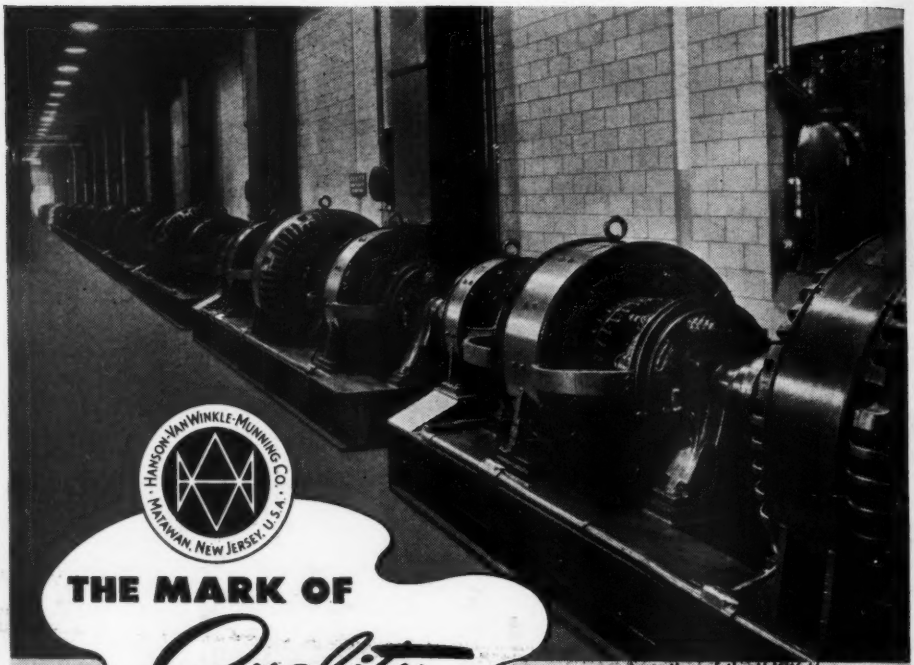
The "Lo-Hi" pH process of chemically cleaning ferrous and non-ferrous metals pre
paratory to plating makes practical a CONTROL in the plating room that gives manage
ment the know-what-to-plan-on the rest of the way in production . . . Our laboratorie
findings and our experience in solving many of these problems, are at your disposa

Lo Hi pH

NORTHWEST CHEMICAL CO.

9310 ROSELAWN DETROIT 4, MICH.

Pioneers in pH cleaning control—serving you since '32



THE MARK OF *Quality*

A portion of the H-VW-M generator installation at Koppers Company, Inc., American Hammered Piston Ring Division.

When your generators bear the H-VW-M trademark, you can depend on high operating efficiency, accurate voltage regulation, and long service life. You can count on maintaining the uniform quality of your product as well as meeting your production schedules.

Since 1879, when the first H-VW-M Low-Voltage Generator established its leadership, improvements in its design and construction have been constantly incorporated – improvements which contribute years of trouble-free operation, extra years that go beyond your service expectations.

For more information about H-VW-M generators, their use and performance, send for your copy of Bulletin G-101.

Manufacturers of a complete line of electroplating and polishing equipment and supplies

HANSON-VAN WINKLE-MUNNING CO.

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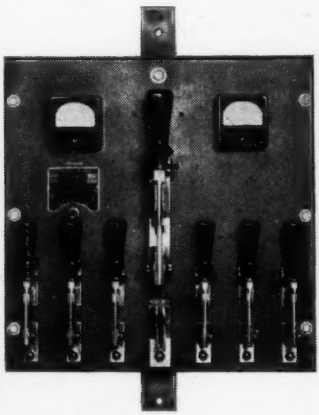
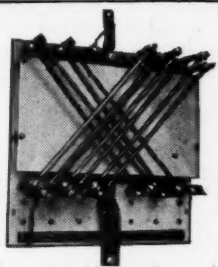
7890

H-VW-M FORM "A" TANK *Rheostat*



Front View



Rear View with Cover Removed

Specify H-VW-M Form "A" Tank Rheostat for each tank when one generator serves a number of plating tanks, each requiring separate control.

Standard sizes are 1500 or 2000 amperes and smaller with any voltage drop needed – generally 3 volt or less is used. We can build units up to 5000 amperes if required.

Load switches are the simple, knife type, but designed shorter and heavier for long life and trouble-free service. A master switch eliminates the necessity for operating the load switches each time the tank is unloaded or loaded, which is standard on 600 ampere and smaller sizes and optional on larger sizes. H-VW-M Form "A" Tank Rheostats can be furnished with ammeter or voltmeter or both, with short-circuiting switch or voltmeter switch or both, if desired.

Write for Bulletin TR-A 526 for complete specifications.

Manufacturers of a complete line of electroplating and polishing equipment and supplies

HANSON-VAN WINKLE-MUNNING CO.

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PROGRESS REPORT NUMBER ONE; A. E. S. RESEARCH PROJECT No. 3, ON "METHODS OF MEASURING ADHESION OF ELECTRO-DEPOSITED COATINGS"

By Dr. Richard M. Wick, Chairman, sub-Committee No. 3 of Research Directing Committee

Project Director: Professor A. L. Ferguson, Chemistry Department, University of Michigan, Ann Arbor, Michigan.

This is the first Progress Report on the study on "Methods of Measuring Adhesion of Electrodeposited Coatings." To collect and analyze all available published data on methods that have been devised is the first and one of the necessary steps in carrying out the project. It has been found that there are very few papers dealing directly with this subject and that the majority of the references are made available only through reading papers on related subjects wherein may be found mention of or discussion on adhesion. Although this makes the collecting of the available information much more tedious than is usual with such investigations, it also suggests that the finished work should have increased value to our membership through making the scattered information readily available.

A total of 129 references have thus far been obtained: 13 major articles have been found; 35 minor articles and 81 references to adhesion in papers dealing with other topics have been located. The indexes to Chemical Abstracts, Metals and Alloys and Metal Progress, have been of little help so that it became necessary to search the technical journals themselves for information. Ten such journals have been examined thoroughly including, for example, 84 volumes of the Transactions of the Electrochemical Society from 1902 through 1943. This work on other individual journals is still in progress.

The publication of the Bibliography is planned on completion of the examination of the journals now being worked on. Following the Bibliography as soon as practicable, there is in preparation a comprehensive report of the methods of adhesion testing that have been proposed, with all the available detail necessary to their operation, especially concerning the mechanics of the testing methods.

Two relatively new methods for testing adhesion have thus far appeared in our search. One of these is a micro-Ollard method, furnishing a quantitative measure for the adhesion of thick electrodeposits (about 0.030 inch thickness.) The other is the British Non-Ferrous Metals Research Association Adhesion Test involving a vibrating ball-ended hammer. This is an inspection test that is non-destructive when the plated coating is adherent; failure is evidenced by a blister forming, usually in about 10 seconds.

The preliminary classification of methods leads to eleven general procedures, including the above, that involve bending in various ways, heating and quenching, extrusion, etc., and the methods that are due to Ollard, Mesle, Burgess, Jacquet, Bablik and Hothersall. Equipment for the significant methods, necessary to the experimental part of the Research Project, should be of permanent value as an Exhibit of our Society, illustrating methods for testing adhesion.

It is respectfully requested of the Membership of the American Electroplaters' Society, and other interested parties, that available information on methods for testing the adhesion of electrodeposited coatings, especially those not yet published, be sent to the Project Director, Dr. A. L. Ferguson, at the address given at the beginning of this progress report.

Where feasible, this information should be transmitted through the Branch Research Committee, otherwise directly to Professor Ferguson. All such information will be gratefully received both for its essential value to your Research Project and in evidence of the cooperation characteristic of our Society.

FINISH! FINISH!
WHO'S GOT THE FINISH?

Every day in the week, manufacturers come to us with some finishing problem or other. Problems others have tackled and muffed. The challenge is always the same . . . "Can YOU give us the finish we need?" Our reputation for succeeding where others have failed is no mere accident. Over the years, we have amassed bulging files of formulas that hold the answers to a host of finishing problems.

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Use the McAleer Composition That's "Right" for Your Job

Cost of buffing and polishing materials is an important factor in metal finishing, yet the material that is low in price may be expensive in the long run. Savings in a barrel of composition may very quickly be dissipated along the production finishing line or entirely wiped out when the finish has to meet the hypercritical demands of micronic measurement standards.

There are too many factors governing war production finishing to allow for "Eenie, meenie, minie, mo" buying. Critical shortages of vital "base" metals—the threat to the investment representing a multitude of operations to complete important precision parts, make it imperative that you use a buffing or polishing composition that is exactly "right" for your job. Rejections mean hundreds of dollars and irretrievable man-hours lost—to say nothing of unbalanced output schedules.

That's an important reason for using McAleer *quality-controlled* compositions. Their "job-fitted" characteristics invariably deliver a value beyond purchase price that pays out in extra performance on the job.

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QUALITY-CONTROLLED
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TAPE OR COATINGS?

MICHIGAN CHROME SUPPLIES THE

Exact

MATERIAL TO MEET YOUR NEEDS

★ **For Insulation of Plating Racks**

★ **For Masking Parts Prior to Selective Plating**

WITH the addition of Miccrotape to the line of "Miccro Products", we can now meet *any* requirement for protective materials used for insulating plating racks or masking parts.

Miccrotape is the first tape of its kind to be produced by an extruding process to provide extremely easy application, smooth over-lapping and a snug fit around every surface. This, and many other features, make it extremely effective in use with all types of plating solutions.

Under conditions where lacquer coatings are most desirable, this company offers five types of Micro-Supreme Stop-Off Lacquers and Miccrolite or Miccroflex. These are the materials which, for years, have had greater acceptance throughout the plating industry than any similar products.

The line of "Miccro Products" is comprised of materials developed and manufactured by experienced platers for the primary purpose of producing in their own plant better plating at lower cost. They can be depended upon to help you achieve the same results.

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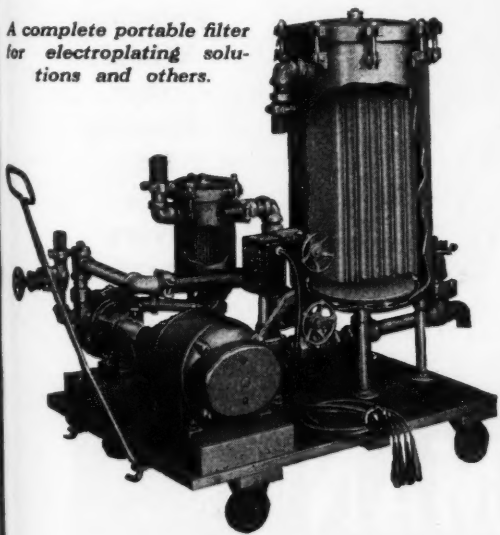
SALT FOG CORROSION TEST EQUIPMENT

This modern instrument is designed to meet all requirements of latest "SALT FOG TESTING PROCEDURE SPECIFICATIONS" to determine corrosion resistance of plated, coated, lacquered, or painted parts.

Serious rejection losses on industrial finishes which must meet Army or Navy Specifications are avoided by systematic tests with Industrial Salt Fog Test Equipment.

MADE IN FIVE STANDARD SIZES

A complete portable filter for electroplating solutions and others.



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Industrial filters offer you a modern and dependable clarification and purifying system to keep your plant producing at top speed. Avoid costly losses by using the correct size and type of filter for the job to be done. Industrial filters are made in a wide range of sizes and capacities, both portable and stationary. They are designed and built to use all the modern filter aids in a highly efficient manner. Our method means fine filtration at low cost.

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RIPPLE SEWED
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Polishing Wheels and Burring Bobs for every Operation

We are engaged essentially in War Work

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A NEW DEVELOPMENT IN METAL STRIPPING

Safe and more efficient than former methods

Among the advantages of **ACTALYTE** in removing copper coatings from steel are:

* **Speed of removal.**
* **Does not attack basis metal.**
* **Non-use of electricity.**

ACTALYTE No. 2 removes not only light copper coatings but has been found to have the ability to dissolve coatings of copper up to ¾ inch thick from steel without undue attack on the basis metal.

ACTALYTE No. 2 was developed to provide a safe, rapid and dependable copper stripper which could be produced from readily available chemicals at reasonable prices. War demands had made chromic acid and other chemicals required by former stripping processes costly and at times impossible to obtain.

Complete information regarding **ACTALYTE No. 2** and its use is contained in ACP Technical Service Data Sheet No. 13-14-2-2 on request to Dept. N-2.

AMERICAN CHEMICAL PAINT CO.
AMBLER ACP **PENNA.**

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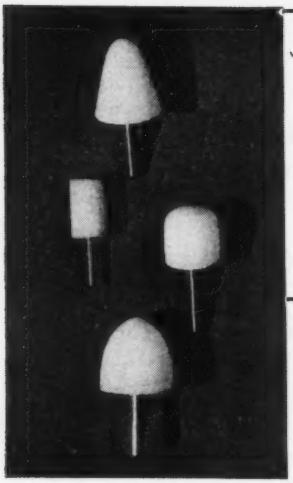

PARAMOUNT BRAND

Just What You Need to SPEED Production

MANDREL-MOUNTED FELT BOBS

PARAMOUNT BRAND Felt Bobs are now available in a wide range of styles and sizes mounted on 1/8 and 1/4 inch diameter mandrels.

These mandrel-mounted bobs help speed production when operations are carried on by means of portable air or electric tools, flexible shaft equipment, lathes, drill presses, etc. No time is lost in fitting a new bob on an old mandrel. Simply slip a new mandrel-mounted bob into place. Another advantage: these mandrel-mounted bobs are "true."

Write for literature giving full information concerning these PARAMOUNT BRAND Mandrel-Mounted Felt Bobs.

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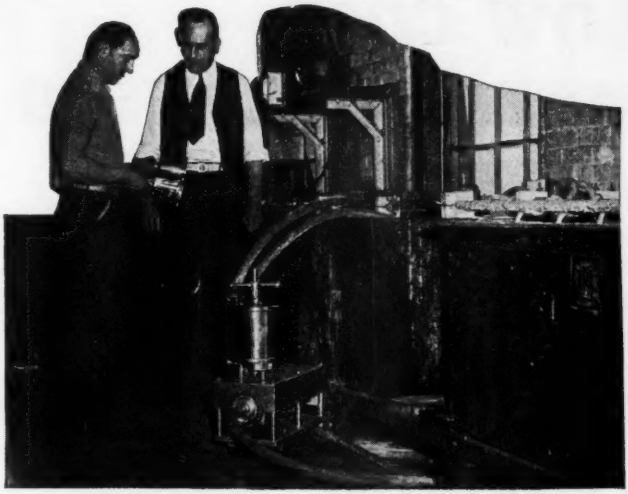
"America's Oldest Felt Manufacturers"

Winchester, Mass. **Established 1824**

"Felt Does It Better"



Alsop "SEALED DISC" FILTERS
MAKE PLATING SOLUTIONS CLEAN

Every plating man knows this to be true and he also knows that clean plating solutions mean finer finishes, fewer rejects to be done over again. This low cost filtration pays real dividends.

Alsop "Sealed Disc" Filters are made in portable types for all capacities. Also for all kinds of liquids, Water, Acids, Chemicals, special types for all Oils, etc.

Learn all about this remarkable form of filtration.
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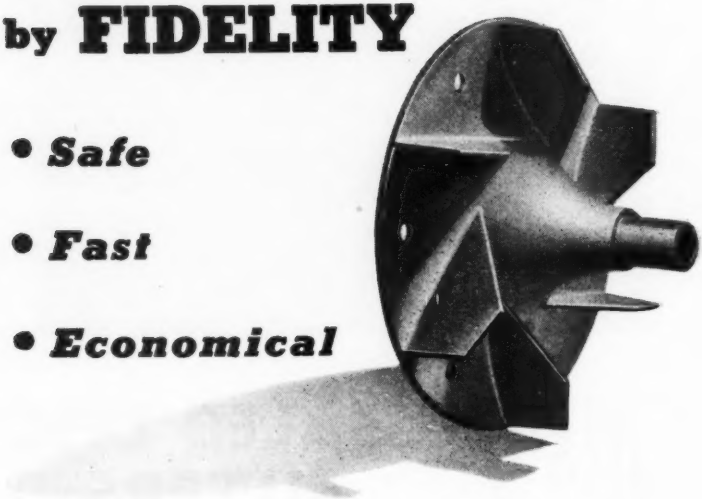
LOW COST METAL CLEANING by FIDELITY

- *Safe*
- *Fast*
- *Economical*



Heavy deposits of grease and oil vanish quickly when Fidelity cleaners are used. Guaranteed not to attack the metal, these products "bite in" to remove every trace of grime. They leave a perfectly clean surface ready to receive plating and other types of finishing.

Fidelity products are recommended by expert service engineers who will survey your cleaning requirements entirely free of charge.

Start now to step up efficiency and lower costs by writing to:

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✓CHECK FOR INFORMATION OR WRITE FOR HELP ON PROBLEMS

OUR line of Special Finishes for Electroplaters meets all customary requirements. For detailed information on any of these finishes, merely check the list below, attach to your letterhead and mail.

If, however, you have an individual problem, write for the helpful Wartime Consultation Service of our staff of finishing engineers. They will gladly give you the benefit of a vast amount of research into materials and methods to relieve today's problems of shortages and curtailments. There is, of course, no obligation.

CLEAR LACQUER for steel . . silver . . gold . . brass . . copper . . nickel and other metals . . .	**NON-STAIN SPOT LACQUERS** especially developed for protecting coatings of copper . . brass . . silver . . .	**WATER-DIP No. 33** for iron, aluminum, cadmium - plated and other production plated parts . . eliminates fingerprints and staining during assembly.
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TOP-COAT LACQUER high gloss . . mat . . .	**LACQUER-ENAMELS** in all colors and for every purpose . . .	**DULAC RACK ENAMELS** for protecting plating racks . . .
DULAC STOP-OFF LACQUERS for sectional plating . . .	**CLEAR PRIMERS**	**PLATELUSTRE** a semi-transparent coating that simulates many plated finishes and gives a colored metallic effect.

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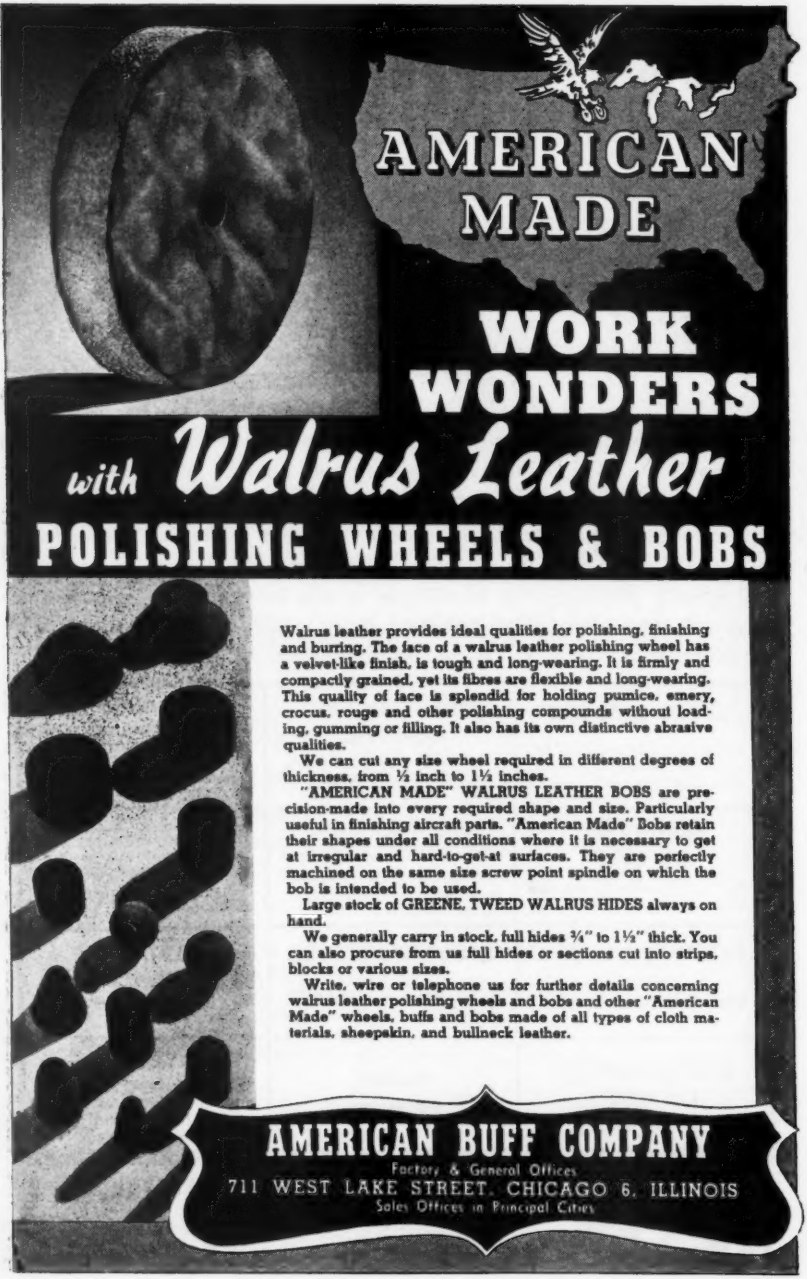
AMERICAN MADE
WORK WONDERS
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POLISHING WHEELS & BOBS
Walrus leather provides ideal qualities for polishing, finishing and burring. The face of a walrus leather polishing wheel has a velvet-like finish, is tough and long-wearing. It is firmly and compactly grained, yet its fibres are flexible and long-wearing. This quality of face is splendid for holding pumice, emery, crocus, rouge and other polishing compounds without loading, gumming or filling. It also has its own distinctive abrasive qualities.
We can cut any size wheel required in different degrees of thickness, from ½ inch to 1½ inches.
"AMERICAN MADE" WALRUS LEATHER BOBS are precision-made into every required shape and size. Particularly useful in finishing aircraft parts. "American Made" Bobs retain their shapes under all conditions where it is necessary to get at irregular and hard-to-get-at surfaces. They are perfectly machined on the same size screw point spindle on which the bob is intended to be used.
Large stock of GREENE, TWEED WALRUS HIDES always on hand.
We generally carry in stock, full hides ¾" to 1½" thick. You can also procure from us full hides or sections cut into strips, blocks or various sizes.
Write, wire or telephone us for further details concerning walrus leather polishing wheels and bobs and other "American Made" wheels, buffs and bobs made of all types of cloth materials, sheepskin, and bullneck leather.
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FOR PLATERS & FINISHERS

With direct or reverse current, or without electric current, Cowles AP Cleaner does exceptional, time-saving work. *No fuming, no rejects, speed* without reducing quality.

Inexperienced workmen get results with Cowles AP Cleaner. A trial drum will prove it. Prompt shipment.

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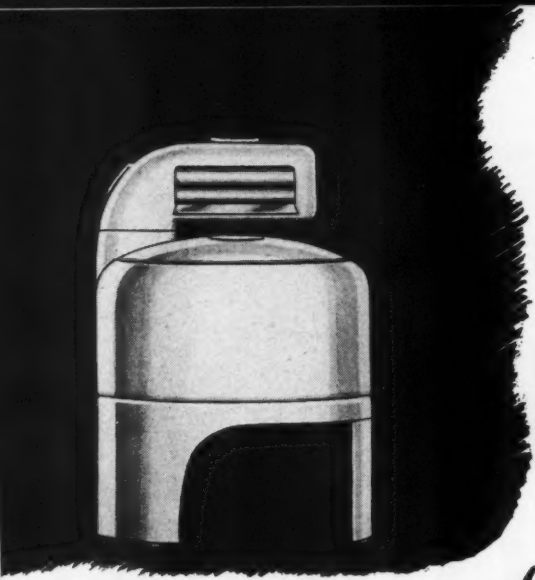

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DURANITE

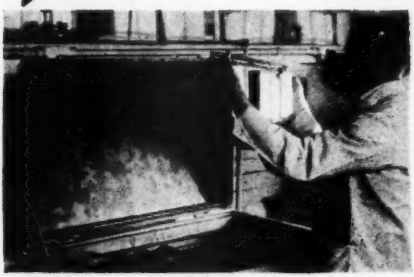
Custom Designed for an Industry

A product that bears your name or trademark deserves quality protection—the kind of protection obtained from a finish with an equally significant trademark, Zapon Duranite.

For years, Zapon's laboratory technicians have conducted a program of testing that has served as a guide in the production of custom finishes for an industry. For instance, Duranite has been scientifically developed to meet every requirement of a durable stay-right finish for washing machines and wringers.

In whites, ivory and pastels, Duranite meets your needs with these qualities: high resistance to water, acids, alkalis, heat and abrasive action.

Now, of course, all facilities must be devoted to war needs but certain Duranite formulations are available.



SALT SPRAY CABINET—One of the Zapon laboratory's many testing devices, this cabinet by accelerated salt spray action provides a quick method of finding out how resistant to corrosion the finish really is.

A FINISH ROLL OF HONOR

DURANITE:	Short bake finishes.
EXCELGLASS:	Elastomer base corrosion-resistant finish.
ZAPONITES:	Lacquer type wood finishes.
DURELASTO:	A new plastic base wood finish.

You can step up sales appeal of many Zapon finishes by using Metalite, a color enhancing finish.

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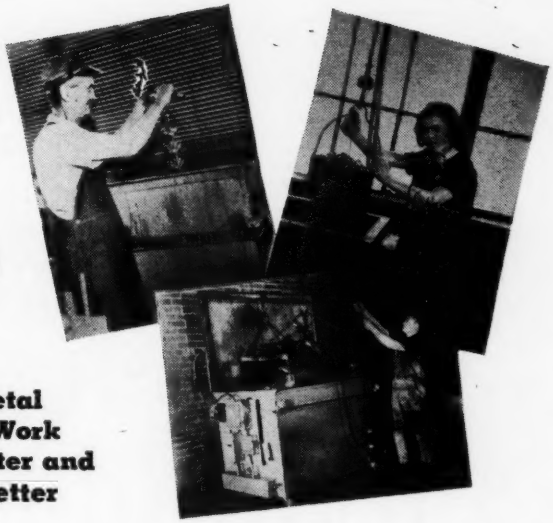
INDUSTRIAL PRODUCT FINISHES . . . *Doing Tomorrow's Job Today!*

THE MAGNUS ALL PURPOSE METAL CLEANING MACHINE



Cleans Any Metal Any Work Faster and Better

This new metal cleaning machine (portable if required) is made in such a wide range of capacities that a size can be selected to handle your volume of work, no matter how large or small it may be.

This machine is based on a superior method of agitation which dips the work *in* the cleaning solution on a rapidly repeated cycle. This provides a great number of *swishing* contacts of the solution with all parts of the work and its recesses. Cleaning time has been reduced by as much as 80% by this machine.

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Further Experiments in Rainbow Plating. By OLIVER P. WATTS. Electrochemical Society—Preprint 85-13 for meeting of April 13-15, 1944, p. 135-136.

Supplementing a brief account, recently presented, of rainbow plating, the electrodeposition of brilliantly colored plates on metallic cathodes from a hot solution of ammonium molybdate, the results of further experiments with this solution are presented and also an account of the production of similar colors on anodes in a solution of sodium plumbate.

FRANK K. SAVAGE, VINCENT MATTACOTTI

Why Not a 50:50 Cobalt-Copper Alloy? (Codeposition of Cobalt and Copper). By COLIN G. FINK and J. LAURENCE HUTTON. Electrochemical Society—Preprint 85-18 for meeting of April 13-15, 1944, p. 191-203.

To prepare a workable alloy of equal parts of copper and cobalt has so far not met with success when resorting to ordinary fusion processes. Accordingly attempts were made to prepare such an alloy by two other, different methods. Part I records the various attempts made to prepare the alloy by codeposition. Part II is a report on the attempts made by powder metallurgy. Neither of these two methods resulted in a true 50:50 alloy.

FRANK K. SAVAGE, VINCENT MATTACOTTI

Structure of the Anodic Passive Layer on Zinc. By K. HUBER. *Z. Elektrochem.* **48,** 26-9 (1942).

The passivity of zinc and in particular the color changes which a zinc anode undergoes in NaOH solutions of various concentrations are discussed. As NaOH concentration increases the darkening of the anode is less pronounced when viewed by reflected light, although in diffused light the differences in color are not so noticeable. At low NaOH concentration amorphous $Zn(OH)_2$ appears on the anode. The passive layer can be removed as thin scales after momentarily reversing the current so as to make the anode active again. The scales, which have a highly disperse structure, are doubly refractive. The structure of the layer as revealed by X-ray analysis is discussed.

British Chem. and Physiological Abstracts

Sources of Hydrogen in Steel and Means for its Elimination. By CARL A. ZAPFFE. *Metal Progress* **43,** No. 3, 397-401 (1943).

The principal source of H_2 is H_2O—liquid, vapor or chemically combined as Fe rust. Recommended procedures are given for enameling, heat-treatment, electroplating and melting.

W. A. MUDGE,
Chemical Abtracts

Correlation of Solution Potentials with Orientations of Single Crystals of High Purity Aluminum. By C. J. WALTON. Electrochemical Society—Preprint 85-7 for meeting April 13-15, 1944, p. 71-84.

Large grained specimens of high purity aluminum were prepared by the strain-anneal method. Several grains with widely different orientations as determined by the Laue back-reflection method were selected for this investigation. The solution potentials of metallographically polished faces of these grains were measured in concentrated hydrochloric acid against a 0.1 N calomel reference cell. The resistance of the faces of these grains to the action of concentrated hydrochloric acid was determined by measuring the relative amounts of hydrogen evolved. A unique method, employing a plastic composite of the faces of four grains of widely different orientations, permitted simultaneous preparation and measurement of solution potential alone, or of both solution potential and hydrogen evolution simultaneously. The results, therefore, were directly comparable. The data consistently revealed that the differences in solution potential with marked changes in orientation were very small, and perhaps were not significant. However, there were differences in the rate of attack of the different crystal faces which are considered of significance.

VINCENT MATTACOTTI, FRANK K. SAVAGE

The Reactivity of Aluminum, Zinc, and a Zinc Base Die Casting Alloy with Various Electrolytes. By JOSEPH V. PETROCELLI and ARTHUR PHILLIPS. Electrochemical Society—Preprint 85-6 for meeting of April 13-15, 1944, p. 51-70.

A study of the electrochemical behavior of aluminum, zinc, a zinc base die casting alloy and its constituents was made. The changes with time of electrode potentials were recorded and polarization measurements were carried out in solutions representing those used in electrodeposition practice. Experimental evidence is presented to suggest that the mechanism of corrosion of aluminum, zinc, and their alloys is largely electrochemical in nature. The corrosion current on pure aluminum and pure zinc has been determined by a cathodic polarization method and checked by weight loss measurements. Many couples of the individual metals concerned have been studied and the interaction currents determined. Polarization studies on composite electrodes show how the current densities may distribute themselves on heterogeneous surfaces. An explanation is offered of the mechanism of the blistering phenomenon in electrodeposits on zinc base die castings.

VINCENT MATTACOTTI, FRANK K. SAVAGE

The Electrolytic Reduction of Acetophenone in Alkaline Solution. By SHERLOCK SWANN, JR., P. E. AMBROSE, R. C. DALE, R. C. ROWE, H. M. WARD, H. D. KERFMAN and PFC. SYDNEY AXELROD. Electrochemical Society—Preprint 85-9 for meeting of April 13-15, 1944, p. 94-99.

The electrolytic reduction of acetophenone was carried out in alkaline solution at many different cathodes. The effect of the surface of the cathode material was studied. The main product of the reduction was found to be the pinacol and the most active cathode material to be tin.

VINCENT MATTACOTTI, FRANK K. SAVAGE

Determination of Small Amounts of Chloride in Copper-Refining Electrolyte by Potentiometric Titration. By YU-LIN YAO. Electrochemical Society—Preprint 85-11 for meeting of April 13-15, 1944, p. 121-126.

A control method for the determination of small amounts of chloride in copper-refining electrolyte by potentiometric titration with silver nitrate solution is suggested. A silver-silver chloride electrode is used as the indicating electrode. A normal calomel electrode is used as the reference electrode. The equivalence point is estimated by finding the volume of titrant required to bring the cell to a definite potential.

VINCENT MATTACOTTI, FRANK K. SAVAGE

Address requests for patents to the Commission of Patents, Washington, D. C.

HENRY STROW

October 31, 1944

#2,361,554 — Method of making doctor blades by Axel E. Lundbye, assigned to Crowell-Collier Publishing Co. Method of making a doctor blade for use with printing cylinders which includes the flash plating with chromium of a relatively thin steel blade having a thin forward edge adapted to engage the surface of a printing cylinder the thickness of the chromium being from .0001″ to .00014″ and extending substantially an inch and a half back on the blade, heat treating the blade in oil at 450° F. for 1 to 3 hours, cooling in oil to 100° F. and then to room temperature removing the blade and grinding the forward edge to remove the chromium plate from said forward edge.

November 14, 1944

#2,362,474 — Electroplating apparatus by Charles W. Elsenheimer, assigned to Manning Bowman Company. An apparatus for electroplating an article of hollow-ware consisting of a rack which maintains the article in an upright position in the plating solution and in an inverted position when removed from the solution.

November 21, 1944

#2,363,005 — Plating fixture for gas cylinders of rifles by George Kalista. A fixture for plating the internal surface of a hollow cylinder having a radially depending bracket consisting of an internal anode with means for connecting to adone rod and spacing means arranged with apertures to permit solution flow.

#2,363,337 — Mold & Process of making it by James M. Kelly assigned to Westinghouse Electric & Manufacturing Co. A process of reinforcing a mold member consisting of plating a thin film of chromium on the facing edge of the mold allowing the film of chromium to become oxidized, applying to the back of the mold a metal in a finely divided state and impregnating the finely divided metal with a metal having a lower melting point and capable of wetting the finely divided metal and the mold thereby to bond the finely divided metal into a strong supporting member which is bonded to the mold the thin film of oxidized chromium on the face of the mold preventing the low melting point metal from wetting the face of the mold.

#2,363,339 — Method of beautifying and protecting surfaces of aluminum and aluminum alloys by George Kraft and Nathan L. Solomon. A process consisting of subjecting a body of cleaned aluminum as an anode in a solution of water with 5 — 40% by volume of hydrofluosilicic acid and under electrical pressure of 6 to 40 volts for a time sufficient to provide a surface finish on said body emanating iridescent colors.

November 28, 1944

#2,363,973 — Method of copper plating stainless steel cooking vessels by J. M. Kennedy, A. P. Knight and H. J. Lee assigned to Revere Copper & Brass, Inc. The method of coating the bottom and adjacent side wall surfaces of a stain-

less steel cooking vessel with a strongly adhering layer of copper which comprises preliminarily treating said surfaces to roughen them subjecting the roughened surfaces to electrolytically released hydrogen without depositing metal on them by immersing the bottom portions only of the vessel in a non-metal bearing aqueous sulfuric acid and making them cathodic while rotating the vessel, removing from the acid and transfering immediately to an acid copper solution and striking the vessel while rotating at a current density of less than 100 amperes per square foot and then transferring to a high copper content acid copper solution and plating to required thickness at a higher current density.

December 5, 1944

#2,364,503 — Bearing & method of making same by George Zink, assigned to General Motors Corp. Method of making a lined bearing which consists of tin plating a cylindrical shell, heating the plated shell in a bath of molten tin removing the shell from the bath and introducing into it a molten alloy consisting of .1 to 1% calcium, from 4 to 10% tin and the balance lead, spinning being continued until the alloy solidifies in the shell.

December 7, 1944

#2,364,564 — Apparatus for electroplating by Randolph Strickland and Harold Lemon assigned to Detroit Aluminum & Brass Corp. Apparatus for electroplating the inside and outside of a tube simultaneously comprising a tube support and an anode assembly, the tube support being of a character to leave exposed the surfaces of the tube to be plated, the anode assembly consisting of a body whose lower end is adapted to be disposed within the upper end of the tube and supplementary elements secured at the upper end only to such body at a point above the tube and adapted to be disposed around the upper end of the tube outside of it, the anode assembly moving as a unit during the positioning of the tube and the anode assembly for plating.

December 12, 1944

#2,364,822 — Plating rack by Max Schneider — A knockdown plating rack comprising at least two rod-like sections arranged substantially end to end a tension element extending between and connecting said sections and having a screw threaded engagement with at least one of said sections, the adjacent ends of said sections having clamping shoulders adjacent said tension element and a work supporting element extending laterally from said sections and having an opening through which said tension elemtn passes, a portion of said work supporting element adjacent said tension element being clamped between said shoulders and said work supporting element being angularly adjustable about the axis of said tension element.

#2,364,964 — Process for protecting metals made of light metals by Jean Frasch vested in the Alien Property Custodian. A process for protecting an aluminum alloy article against corrosion comprising immersing the article to be protected in a bath consisting of approximately 30 grams of sodium aluminate, 10 grams of sodium silicate and 8 grams of caustic soda per liter of solution having a pH between 8.5 and 12 and then passing between said article serving as an electrode in said bath and another electrode therein an electric current having an initial potential greater than 30 volts.

#2,364,976 — Degreasing apparatus by Max Heller. An apparatus for vapor degreasing having a condenser mounted above the work to be degreased to drip solvent through the work.

#2,364,993 — Process for blackening copper or copper alloy surfaces by Walter Meyer. The process of producing a black surface on copper or alloys which comprises immersing the surface in a hot aqueous solution consisting essentially of a solution of sodium or potassium hydroxide and sodium or potassium chloride.

BOOK REVIEWS

DR. GEORGE DUBPERNELL

The Polarographic Method of Analysis. Otto H. Muller. 114 pages. Journal of Chemical Education, Easton, Pennsylvania, 1941. Price $1.00.

In connection with the above book, the following comments from an authority on the subject of Polarography should be of interest:

"The polarographic method of analysis has become very popular in this country during the last few years. It was originated in 1922 by Dr. Jaroslav Heyrovsky at the Charles University at Prague, Czechoslovakia. Dr. Otto H. Muller, the author, is a former student of Dr. Heyrovsky's. His booklet will serve very well as an introduction to this field for the electroplater, who may not care to study the more complete work on Polarography by Kolthoff and Lingane. Electroplaters should follow the progress in Polarography closely because it not only supplies a very fast and versatile analytical tool, but it has also contributed valuable information to the theory of electrochemical reactions.

"Polarography is the study of current-voltage curves. Each electrolytic solution has its own characteristic current-voltage curve which depends on the different electrolytes and molecules present, and on the electrodes used for the experiment. In Polarography, the dropping mercury electrode is used preferentially because the current-voltage curves are very reproducible with these electrodes. However, other electrodes have been used — mostly of noble metals — and these investigations have yielded valuable information. To take a polarogram of a solution means to plot the current observed against the voltage applied.

One starts out with a solution containing the substance to be determined and a suitable supporting electrolyte, e.g., potassium chloride or in other cases, potassium cyanide. One applies a positive or zero potential to the dropping mercury electrode is used preferentially because the current-voltage curves are very reproducible with these electrodes. However, other electrodes have been used — mostly of noble metals — and these investigations have yielded valuab'e information. To take a polarogram of a solution means to plot the current observed against the voltage applied.

"One starts out with a solution containing the substance to be determined and a suitable supporting electrolyte, e.g., potassium chloride or in other cases, potassium cyanide. One applies a positive or zero potential to the dropping electrode and gradually makes the potential more negative taking current readings along the way. The current will remain small (residual current) until the potential is reached, at which one substance present in the solution can be reduced or plated out. This potential is closely related to the thermodynamic equilibrium potential of the substance under these conditions.

"The current observed is, in many cases — one can say in most cases — directly proportional to the concentration of the reducible substance in solution. The current will then stay practically constant, while the potential is made more negative, until another species of ions or molecules can be reduced. This is due to the fact that the electrical field in the solution is zero and ions or molecules reach the electrode by diffusion only. This is also the reason that the potential can be changed before the reducible substance in the solution is exhausted by electroysis. As a matter of fact, the time for a full polarogram need only be a few minutes, and the amount of material electrolyzed is negligible, being only that in the diffusion layer around the cathode.

"The booklet, after a review of other electrochemical methods of analysis, describes the automatic polarograph very briefly and discusses in detail a very simple manual device for taking polarograms which is inexpensive and which will work satisfactorily for many practical applications. Simple types of cells and electrodes are described in this chapter.

"The following two chapters give the fundamentals of the underlying theory. For their understanding only the most elementary laws of chemical equilibrium are needed.

"The last chapter enumerates some applications and gives examples of the use of the dropping mercury electrode as an indicator electrode, for volumetric determinations. This booklet deserves the attention of the electroplater."

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(1) An Introduction to Electrochemistry. By Samuel Glasstone. 553 pages. $5.00.

(2) Modern Metallurgy for Engineers. By Frank T. Sisco. 432 pages. $4.50.

(3) Standard Handbook for Electrical Engineers. Edited by A. E. Knowlton and R. M. Shook. 2303 pages. $8.00.

(4) Principles and Applications of Electrochemistry, Volume I, Principles. H. Jerman Creighton. Fourth edition. 477 pages. $5.00.

(5) Electroplating and Anodizing. By J. Rosslyn. 224 pages. $2.50.

(6) Hardness and Hardness Measurements, Samuel R. Williams. 558 pages. 1942. Price $7.50.

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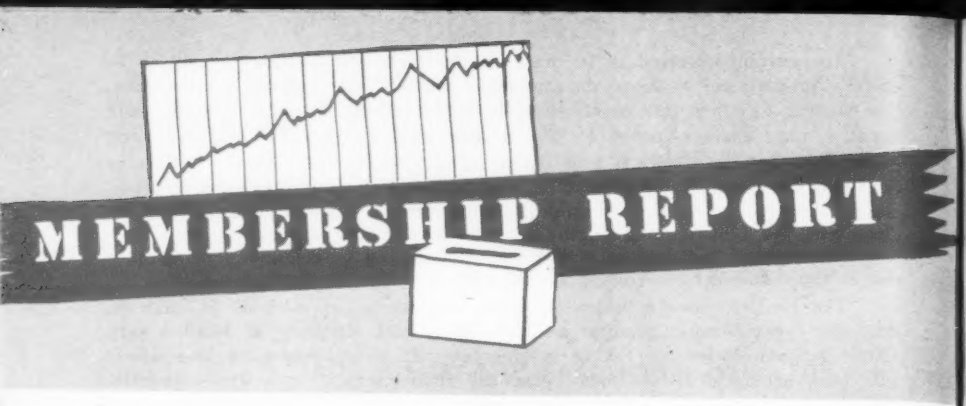

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LOS ANGELES	123	+18	+14.6
BOSTON	130	+17	+13.
HARTFORD	114	+14	+12.2
DETROIT	336	+33½	+ 9.9
PHILADELPHIA	138	+12	+ 8.8
WATERBURY	111	+ 9	+ 8.1
CHICAGO	323	+23	+ 7.1
NEWARK	198	+11	+ 5.5
ST. LOUIS	111	....	....
SECOND GROUP			
DAYTON	100	+10½	+10.5
NEW HAVEN	95	+10½	+10.5
TORONTO	109	+10	+ 9.1
BRIDGEPORT	102	+ 8½	+ 8.3
MILWAUKEE	97	+ 8	+ 8.2
BALTIMORE-WASH.	107	+ 8½	+ 7.9
BUFFALO	80	+ 6	+ 7.4
GRAND RAPIDS	109	+ 7½	+ 6.8
SPRINGFIELD	79	+ 3½	+ 4.4
ROCHESTER	83	+ 3	+ 3.6
THIRD GROUP			
PROV.-ATTLEBORO	66	+29	+43.9
INDIANAPOLIS	74	+32	+43.2
TOLEDO	42	+13	+30.9
SYRACUSE	51	+13½	+26.4
JACKSON-LANSING	51	+11	+21.5
PITTSBURGH	68	+10½	+15.4
LANCASTER	40	+ 2	+ 5.
CINCINNATI	63	+ 2	+ 3.1
SAN FRANCISCO	39	+ 1	+ 2.5
MONTREAL	50	+ 1	+ 2.
AUSTRALIA	51	....	....
TWIN CITY	39	....	....

Membership May 1, 1944 = 3385 ‖ Gain in Membership = 372½
Membership Feb. 1, 1945 = 3757½ ‖ Per Cent of Gain 11%

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BRANCH NEWS

SPRINGFIELD BRANCH

An informal meeting of the Springfield Branch, American Electroplaters' Society was held at the Hotel Charles, Springfield, Mass. on December 18, 1944. The meeting was called to order at 8:15 P.M. by President Hastie.

The only formal action of the meeting was the acceptance of the application of John Francis Horrigan for Associate membership.

The remainder of the meeting was taken up by informal discussion of such subjects as: the possibility of sustaining membership by various companies; also the two classes of membership.

The meeting adjourned at 9:45 P.M.

PAUL F. LYMAN, *Sec'y-Treas.*

TWIN CITY BRANCH

The regular monthly meeting of the Twin City Branch was conducted on Monday evening, January 8th at the Hotel Andrews, Minneapolis.

Mr. Paul Felt, vice-president of the Twin City Branch, called on the new members from whom we have received applications for membership so that the branch members might meet them. The prospective members were: John Lynard of C. B. Lyon & Son; Ben W. Rosenthal of Wyandotte, Russell Goodlund of Jari Products, Frank Nelson of Perfection Manufacturing, B. N. Beck of Beck Plating Company.

Minutes and financial reports were read and approved by the membership.

Our membership chairman, Paul Felt, then embarked on our new membership project, that of drawing a member's name out of a hat and if that member can name the person directly opposite to him, he is awarded a free dinner. The member to become the first to get a free dinner was Mr. Dean C. Thom of E. R. Forst Co.

President E. H. Lindemann then presented Mr. G. S. Krentel of MacDermid, Incorporated who presented a very interesting talk on metal cleaning discussing all types of cleaners; still and electric as well as vapor degreasers and alkali washers. After Mr. Krentel's talk, the members asked several questions which were answered by the speaker.

Mr. Lindemann closed the meeting at 10:00 P.M.

ROBERT L. BUCKLEY, *Secretary*

WATERBURY BRANCH

Waterbury Branch held its regular meeting Friday, January 12th, at the Hotel Elton. The technical meeting was opened promptly at 8 P.M. by President Maz.

The first business was the election of William F. Eddy as an associate member, then Ellsworth Candee was called upon to briefly explain the progress of the research work. At the present time there are three important short time projects being conducted at various universities. These are the determination of the best methods for stripping copper from steel, methods for determining small amounts of impurities in electroplating solutions and methods of determining the adhesion of plated metals.

Following this, Wes Cassell, Technical Chairman, conducted the rest of the program presenting Jack Hyner, first, in our regular book review. Jack reviewed the paper by Hothersall and Leadbeater on "Inspection Tests for the Adhesion of Electroplated Coatings with Particular Reference to the B. N. F. Adhesion Test." It will be interesting to compare the results of these tests with those of our own research.

Bill Starr in discussing priorities spoke about the present shortage of sodium cyanide which is getting more difficult to obtain all the time. There is a possibility that the situation may be relieved in February or March by shipments of sodium cyanide from England. At the present time, potassium cyanide is being used to quite an extent to replace the sodium salt, but there has been such a drain on this material that it too has become short.

Henry Strow opening a new feature concerning recent developments in electroplating, reviewed some of the more important developments in 1944. We believe this should be a continued important feature of our program, bringing us up to date on what is new in the electroplating field.

Our moving picture on "Plastics," shown through the courtsey of the Boonton Molding Co. depicted the types and kinds of material used and the products and their methods of manufacture in a very interesting and effective manner. The film was in technicolor and was quite unusual in its method of presentation.

Mr. R. B. Saltonstall of the Udylite Corp. was the speaker of the evening. He discussed the "Past, Present and Future of Bright Nickel," covering its early history and the progress that had been made up to the present war, when electroplated nickel was drastically curtailed, and what might be expected of solutions when we again plate nickel in quantity. The requirements of a good bright nickel solution were covered in detail, with a full discussion of the degree of brightness, throwing and covering power, sensitivity of solution to contaminants and ease of control.

During the question period, Mr. Hogaboom showed us some very interesting samples of bright nickel deposits and deposits from the usual Watts solution, which had been stripped from the cathode and subject to a salt spray. These demonstrated the accelerated corrosion obtained in this test on porous nickel deposits containing non-metallic inclusions.

We all feel deeply indebted to Mr. Saltonstall for his very fine paper and believe we have obtained some new angles to the bright nickel question which will be exceedingly helpful in the future.

S. L. HENN, *Secretary*

NEW YORK BRANCH

The New York Branch held its first meeting of the New Year on January 12, at the Hotel Pennsylvania. The meeting was opened at 8:30 P.M. by President Martin Maher.

The minutes of the meeting of December 8th were approved as read.

There were three applications for membership, those of Frederick Hesch and Jack Weiner who applied for Associate Membership and that of Martin Lapin who desires to become an Active Member.

John Palermo and John Melhado were elected into the branch.

A communication from the Research Committee, listing contributions to the Research Fund was received.

Under Good and Welfare, Mr. Joseph Haas, one of the "old time" members of the New York Branch, gave a talk on "Electroplating, Its Past, Present and Future." As in the past, Mr. Haas' paper which are always of the utmost interest to the members, was well received and a rising vote of thanks was rendered him.

Meeting adjourned at 10:30 P.M.

GEORGE SCHORE

ROCHESTER BRANCH

The Rochester Branch of the American Electroplaters' Society held the regular monthly meeting Friday evening, December 15, 1944.

Minutes and treasury report were dispensed with because of the absence of the Secretary-Treasurer and because of travel conditions for Mr. Mesle, our speaker for the evening.

Mr. Mesle spoke for the Research Program and Fund. He gave a talk on silver plating bearings with thickness ranging from .010 to .060 for the aircraft industry. Mr. Mesle has worked very tediously at this process and has published his paper in the REVIEW and given his talk to many Branches. The members voted that the Research fund be given a $100.00 from the treasury of the Rochester Branch.

Because of the bad weather conditions here in Rochester, very few of the members were able to attend this meeting, we would have had a much better turnout for Mr. Mesle if the city hadn't been tied up because of a heavy snowstorm. All who attended enjoyed the meeting and we all extended our thanks to Mr. Mesle.

The meeting was adjourned at 10:30.

DONALD C. BLUM, *Secretary*

ROCHESTER BRANCH

Rochester Branch of the American Electroplaters' Society held their regular monthly meeting Friday evening, January 199, 1945 at the Hotel Seneca. President John Q. Adams called the meeting to order at 8:00.

Minutes of the previous session were read and approved and the financial report to date was given. All correspondence was read and taken care of. Mr. Paul Tufts was chosen for a membership chairman and Mr. Fred Bruening was chosen for assistant membership chairman. As chairman of exhibits for the Rochester Branch for this year's conference at Pittsburgh, Mr. Elmer Nill was appointed. Applications for three new members were read and approved, our new members are Mr. John Lenzi, Mr. John K. McIver, Mr. John Yanason.

Speaker for this meeting was Mr. L. W. Burton an engineer with the Tungar and Metallic Rectifier Division of the General Electric Co. Mr. Burton discussed the practical aspects of what can be expected in the way of service, maintenance cost and overall performance of electroplating rectifiers. His lecture was illustrated with slides of typical installations.

All members were very interested in Mr. Burton's presentation and this was a very educational and instructive session. We all extend our thanks to Mr. Burton.

The meeting was adjourned at 10:15.

DONALD C. BLUM, *Secretary*

PITTSBURGH BRANCH

The regular meeting of the Pittsburgh Branch was held Thursday, January 4th, at the Roosevelt Hotel. Dinner was served at 6:30 P.M. Due to bad weather only a small group were present.

Following a short business meeting the evening was turned over to Mr. Guerin Todd, Chief Engineer of Hanson-Van Winkle-Munning Company, who talked on motor-generator sets. Mr. Todd gave a very interesting and enlightening talk on the fundamentals and principles of the motor-generator, followed by a detailed summary of the care and repair of generators. The discussion following the talk provided the answers to many practical operating questions of those present.

The next meeting will be held Thursday, February 1st, at the Roosevelt Hotel, when Dr. Charles Faust of Battelle Institute will talk on "Practical Aspects of Electropolishing."

FRANK R. KELLER, *Secretary*

SPRINGFIELD BRANCH

The November meeting of the Springfield Branch, American Electroplaters was held at the Hotel Charles, Springfield, Mass. on November 27, 1944. The meeting was called to order at 8:15 P.M. by Vice-President Copp. The minutes of the October meeting were read and approved.

Librarian Frank Clark then introduced Myron B. Diggin, chief chemist of the Hanson-Van Winkle-Munning Co., Matawan, N. J. Mr. Diggin gave a very interesting paper on "Bright Alloy Plating." The paper was essentially the same that was given by Mr. Diggin and George Jernstedt at the Cleveland Conference. Great interest in "Bright Alloy was shown by the members and visitors and a lengthy question period followed the talk.

Mr. Diggin was given a rising vote of thanks.

There followed a short business session. It was voted to try holding separate business meetings and reserve regular meeting nights for speakers. Notices of the business meetings to be sent out in the usual manner. No regular meeting time was decided on but it was pointed out that the first Monday in the month would conflict with the American Society of Metals. It was also suggested that it might be possible to arrange a joint meeting with the A.S.M. on a subject of mutual interest. It was voted to hold the December meeting on December 18th. Meeting adjourned at 10:15 P.M.

PAUL F. LYMAN, *Sec'y-Treas.*

NEWARK BRANCH

The regular meeting of the Newark Branch, A.E.S., was held on Friday evening, December 15, 1944, at the Hotel Robert Treat in Newark, N. J. The meeting was called to order at 8:30 P.M. with President Robert R. Sizelove, presiding. All other officers were present.

The minutes of the previous meeting were read and approved.

Communications from Franklyn J. MacStoker; Dayton Branch, A.E.S.; L. H. Butcher Company; Otto Messen-

brink and Mitchell-Bradford Chemical Company were read and placed on file.

Applications for Samuel S. Frey of Oakite Products Co.; Robert S. Herwig of Bendix Aviation Co. to Associate Membership and Louis E. Eckelmann of Pyrenne Manufacturing Company to Active Membership were voted to take the regular course.

Mr. Horace Smith reported on the Christmas Party and on the Technical Societies Council Meeting which he and George Wagner attended on December 4th. George Wagner reported that he would probably have this newly organized Society's Bulletin listing all the meeting of all the Associate Societies, by the following meeting.

Our President Robert R. Sizelove made a complete report on what was being done by the Research Committee and Ed Washburn moved that Newark Branch go on record to contribute $1.00 per year per member to the Research Fund. This motion was adapted.

The guest speaker for the evening was Howard L. Cobb one of our own members, employed at the Aircraft Radio Corporation, Boonton, N. J. His subject "Corrosion of Cadmium and Silver Plating on Iron and Invar" proved to be one of the most interesting subjects of the season. The question of releasing Mr. Cobb's paper for publication was left undecided and will be brought up at our next meeting. Mr. Cobb's paper was complete including illustrations and graphs. He was given a rising vote of thanks at the completion of his talk by the 56 members and visitors who attended. Meeting adjourned 11:00 P.M.

The regular meeting of the Newark Branch, A.E.S., was held on Friday evening, January 5, 1945 at the Hotel Robert Treat in Newark, N. J. The meeting was called to order at 8:45 P.M. by our First Vice-President Louis Donroe who presided due to the absence of our President. All other officers were present.

The minutes of the previous meeting were read and approved.

Communications from Otto F. Dingeldein, Harry Simon and Dr. S. Skowronski, thanking Newark Branch for the Year Books were read and placed on file.

Application for Raymond Housel of Ingersoll Rand Co., to Associate Membership was voted to take the regular course.

Elections were as follows: To Active Membership — James L. Hosking of Aircraft Radio Corporation; Emmet J. Ryan, Lambert Meter Company; and Arthur F. Pinard, Jr., Federal Telephone and Radio Corporation. To Associate Membership — Russell K. Johnston of Curtiss-Wright Propellor Division; Millard Loucks, Bart Laboratories; oJseph R. Phillips, Federal Telephone and Radio Corporation; and Fred Eidel, Wright Aero Corporation.

Mr. Horace Smith reported that the record for the Christmas Party would be reported at our next meeting.

Under unfinished business, the question of Mr. Cobb's paper on Corrosion of Cadmium and Silver Plating on Iron and Invar, was brought up again. After considerable discussion, it was decided that this paper should not be released for publication. That a committee should be appointed to assist Mr. Cobb to rewrite and if possible to enlarge on the subject and present it as a Branch paper at our next Convention.

Under new business, it was voted that our Banquet which was scheduled for Saturday, April 7th, be cancelled also that the three speakers who were scheduled to participate in the afternoon session of that date be contacted and asked to appear at our regular meeting on Friday evening, April 6th.

Our scheduled speaker for this meeting was unable to appear but Librarian, Ed Washburn is never at a loss when a situation like this arises. He gave us a talk on the advantages of a Laboratory in a Plating Department. He told us all the facts about setting up a laboratory for his company, how he started out on a small scale and gradually increased it to a first-class Lab, where he spends most of his time. He received a hearty round of applause from the 40 members who attended this meeting.

Meeting adjourned at 10:30 P.M.

GEORGE WAGNER, *Secretary*

LOS ANGELES BRANCH

The November meeting of the Los Angeles Branch of the American Electroplaters' Society was held at the Rosslyn Hotel. Dinner was served at 6:30 P.M. There were 29 members present together with the following guests:

S. F. Peachen, General Electric Co., Ontario, Calif.; Ed George, Ace Plating Co., Los Angeles; F. J. Arata, Maas Walstein Co.

Members Gripp, Bedwell and Eldred read a paper on filtering plating solutions. Among the questions asked were the following:

Q. Do you filter chrome solution?
A. No.
Q. What is the yellow sludge that deposits in the bottom of a nickel tank?
A. Unknown. It has little value. You do not get so much in a high speed nickel tank.
Q. What material should be used?
A. Diatomaceous earth, glass cloth and such materials in the filter construction as will not contaminate the solution, like a duriron pump.
Q. How about carbon?
A. Use on special cases. Watch out for removal of brightners and other organics present.

Frank Bunker read a paper on late developments in barrel tumbling.

Q. What is the relationship between dry and wet tumbling.
A. The wet is four or five times faster, but dry must be used on delicate work.
Q. How does the speed of tumbling effect the work?
A. You cannot exceed a critical speed without dropping the work in the barrel and impinging the work.

At the regular business meeting the secretary's reports were read and accepted. The treasurer's report was also read and accepted.

The following new members were initiated:

Albert Endemano, Endemano Plating Co., Los Angeles; Bert Edward Tuthill, Cadmium and Nickel Plating Co., Los Angeles; Ed George, Ace Plating Co., Los Angeles.

Ed Wells, Chairman of the Membership Committee read an application from Gerald Leslie Shirley of the Spokane Air Technical Service, Spokane, Wash. The members voted to accept the application. Marcus Rhynkof read a letter from Jack Bain thanking the Branch for the sketches of the visitors sent to the REVIEW. Don Bedwell reported no problems sent in the Research Committee. The secretary was instructed to jog the members' memories on the next announcement. Under new business a banquet committee was appointed with Marcus Rhynkof, chairman. It was voted that we have a banquet and educational session in March, 1945.

The December meeting of the Los Angeles Branch of the A.E.S. was held at the Rosslyn Hotel on Monday evening, December 11th, 1944. There were 33 members present and the following visitors:

G. A. Hall, E. B. Straker and S. Schroeder of the U. S. Navy Dry Docks at Terminal Island, Calif.

Allen Webb and Stuart Terry of the Plasti Coat Co., Los Angeles; Mr. McDonald and Thomas Turner of the A. J. Lynch Co., Los Angeles.

Harold Schoonover, now of the Los Angeles Branch, but formerly of the Detroit Branch, gave a talk on a Conveyorized Plating Line.

Among the questions asked were the following:

Q. Why throw away one quarter of the chrome?
A. To keep down zinc due to die cast dropping off.
Q. Was the solvent cleaner agitated?
A. Yes. By air.
Q. Did the nickel blister or the copper?
A. Usually the nickel. Probably due to spotting out. Porosity caused most of the trouble.
Q. How about zinc in the nickel?
A. Raked every night. Checked once a week with spectroscope. Remove zinc with lime and carbon treatment.
Q. Were recesses covered with copper?
A. Covered if work clean.
Q. Did you use anodes in cleaner?
A. Yes. Steel. Three rows in each tank.
Q. How did you strip rejects?
A. Polysulfide for copper. 75% sulfuric for nickel.
Q. What rack coat did you use?
A. Mostly Michigan chrome.

Applications were received from the following:

Edgar B. Straker, Active; Glen A. Hall, Active. These were referred to the oBard of Managers.

Communications were read and accepted and placed on file. The financial report was read and accepted.

The Research Committee reported that another meeting would be held.

The Banquet Committee, Marcus Rhynkof, chairman, reported.

Time to be Saturday, March 24, 1945. Place, the Breakfast Club. Probably the afternoon only for the educational session. Speakers had been mostly arranged for. Dinner a five-course turkey dinner. Each member to solicite commercial exhibits. There will be five or six door prizes. Music and entertainment taken care of.

Chairman Rhynkof reported on a plan for a program directory. He was given a vote of confidence and told to go ahead.

FRANK BUNKER, *Secretary*

MILWAUKEE BRANCH

The Milwaukee Branch held its regular meeting January 5th, at the Wisconsin Hotel.

Mr. Robert Steuernagel, Jr., opened the meeting and immediately a committee for the banquet and educational session to be held April 28th, at the Schroeder Hotel. Mr. Vince Sheehan, Chairman; Mr. William Geissman, Education; Mr. Alex Johnson, Hotel and Menu; Mr. Henry Bornitzke, Publicity; Mr. Henry Binder, Advisor; Mr. Harry Unke, Entertainment and Mr. Frank Marx, Finance.

The discussion about the research fund was continued from the December meeting. Mr. Phil Ritzenthaler gave us a detailed account of the committee's work and progress to date.

The motion that the Milwaukee Branch raise the yearly dues to seven ($7.00) per year, a dollar of which is to go to the research fund, beginning May 1st, 1945 was carried. It was also moved that the branch contribute one hundred dollars ($100.00) as this year's contribution. This was also passed by a large majority. The following men were elected to membership:

Mr. Sidney T. O'Brien, Active, 125 North Hawley Road, Milwaukee 13, Wisconsin; Mr. John Beyerstedt, Associate, 2345 South 64th Street, Milwaukee 14, Wisconsin; Mr. George H. Dinges, Associate, 6313 West Girard Avenue, Milwaukee 10, Wisconsin; Mr. Marvin M. Skogen, Associate, 4820 North 70th Street, Milwaukee 9, Wisconsin; Mr. Clarence E. Bradley, Associate, 3612-A North 21st Street, Milwaukee 7, Wisconsin; Mr. Arthur Hoffman, Associate 8402 West North Avenue, Milwaukee 13, Wisconsin.

The following men made applications for membership:

Mr. Nicholas Ostovich, Associate, 614 North 24th Street, Milwaukee 3, Wisconsin; Mr. Jerome Emil Stowasser, Associate, 1828 West Brown Street, Milwaukee 5, Wisconsin; Mr. Kenneth E. Hess, Associate, 2347 East Ohio Avenue, Milwaukee 7, Wisconsin; Mr. Frederick D. Barber, Associate, 3156 South 21st Street, Milwaukee 7, Wisconsin; Mr. Gordon Smith, Active, R. 4. — Box 511, Kenosha, Wisconsin.

The meeting was turned over to Mr. William Geissman, who introduced Mr. Carl Graber, who gave us some very interesting information about the work being done by the government to increase production. Through education of the supervisors on how to instruct and understand the problems, increases in production have been phenomenal. He was given a hearty applause and the meeting adjourned.

JAMES DURNFORD, *Secretary*

BRIDGEPORT BRANCH

The open meeting of the Bridgeport Branch of the A.E.S. was held in the Yale & Towne Auditorium, Stamford, Conn., January 19, 1945. President McNeil opened the meeting at 8:30 P.M. and after reading a short letter from Wilfred McKeon, Exhibits Chairman for the Pittsburgh Convention, appointed Hubert Goldman as Chairman of the exhibits for the Bridgeport Branch.

The meeting was then turned over to Librarian Fred Gotthardt, who announced the showing of the film on X-rays which was sponsored by the Machlett Laboratories. In spite of projector difficulties, the film proved to be of exceptional interest, and the Bridgeport Branch wishes to thank Mr. Stevenson and the Machlett Laboratories for the opportunity of seeing this truly remarkable picture.

The principal speaker of the evening, Mr. George Hogaboom, was then introduced. George, who is probably the best known figure in the activities of the many Eastern Branches of the Society, presented as his paper, "Metallurgy and Its Relationship to the Plating Industry." In this paper, it was pointed out that not all the responsibilty for plating failures lies with the plater. A great deal of the so-called plating rejects can be avoided by the application of a few fundamental principles of metallurgy throughout the working of the

metal, prior to its entering the plating department. As Mr. Hogaboom put it, a study of Basic Metallurgy is becoming increasingly important to the plater if we expect to reach the peak of plating perfection. Many thanks from the Bridgeport Branch, to George, for his very interesting and informative presentation.

After a rising vote of thanks was extended Mr. Hogaboom, the meeting was turned back to President McNeil, who introduced Captain T. C. Fang of the Chinese Air Force. Captain Fang is an exchange Industrial Student, sent to this country by the Chinese Government through arrangements made with the U. S. Government, to study the ball bearing industry. After his return to his town country, he will help to establish a like industry there. We wish Captain Fang success in his mission and a speedy return to China and his family, and hope that his visit to our meeting proved to be of some value to him.

After announcing that Dr. Walter Meyer would talk to the Branch at its open meeting Friday, February 16, 1945, to be held at the Barnum Hotel in Bridgeport on "Treatments and Finishes for Aluminum."

The meeting was adjourned at 10:50 P.M.

The Bridgeport Branch A.E.S. regular business meeting and Old Timers' Night was held January 5, 1945 at 8:00 P.M. at the Barnum Hotel. President A. R. McNeil opened the meeting with 57 members and guests present and decided to dispense with the formalities of the business meeting and devote the time to Old Timers' Night. We were also honored with the presence of Executive Secretary and Editor E. T. Candee.

First on the program several short moving pictures were shown using our sound projector. President McNeil called upon E. T. Candee who spoke on the Research work done by the A.E.S. in the past and contemplating on future work. The members were asked to support the Research Committee financially and materially including information as to what problems and projects that should be worked on. Candee suggested that a committee and chairman should be appointed in every Branch to contact manufacturers both large and small to support the Research Work and Fund. It was decided that this matter will be taken up at our next regular business meeting.

Next on the program were moving pictures of the 1935 National Convention held here in Bridgeport and sponsored by the Bridgeport Branch A.E.S. in June, 1935 and loaned to us through the courtesy of the Lea Mfg. Co., Waterbury, Conn. by our good friend Earl Couch. It was interesting to note the complete change and design of the clothes worn then by the men and women as compared to the style of the clothes today. A few of the members present ventured remarks complimenting the improvement made especially in the style of dresses worn by our ladies today and lamented sadly that they were born thirty years too soon. Some of the men in the pictures were present in the audience tonight and needless to say they look just as fifine today as they did ten years ago when these pictures were taken.

President McNeil next called upon George Morrow of the Egyptian Lacquer Co. and member of the Bridgeport Branch to present his "Evening of Magic." We all know George and are well aware of his ability to captivate his audiences with his mystifying feats of magic. George has performed before many and various groups and has never failed to completely baffle the onlookers. Well after watching George do his magic tricks for an hour, we are wondering what he is doing with the Egyptian Lacquer Co. It was a very fine and excellent entertainment and George was given a rising vote of thanks by the members and guests present.

By this time we all got hungry and thirsty and took time out to enjoy the food and refreshments. Next on the program called by President McNeil was Bill Ehrencrona, who presented a short skit including some spicy stories. Bill is our member from the Branch and when it comes to telling stories, both good and bad he is excelled by none. Thank you, Bill, for entertaining us. George Morrow decided to entertain us with a few more of his magic tricks for which we thanked him very much.

Guests from the Waterbury, New Haven and Hartford Branch who were present at the Old Timers' Night are as follows:

Waterbury Branch — Harold Leaver, E. T. Candee, Earl Couch.

New Haven Branch — George Knecht, John C. Oberender, John English, Jack Buckman, Jack Barry, Bernard Gaffney, Joseph Sullivan.

Hartford Branch — F. Wieezorek, K. Bellinger.

The Old Timers of the Bridgeport Branch who were also present are:

Fred Lancaster, Phillip Willett, Ben Kusterer, William Thompson, William A. Ehrenerona, Howard Rice, George Morrow, Herman C. Braun, R. J. O'Connor, William Flaherty.

We missed George B. Hagaboom who sent us a letter stating that he was unable to attend but expressed good luck and best wishes to the Old Timers and members present at the meeting.

A very good time was had by all present. The Old Timers' meeting was adjourned at 12:30 A.M.

JOSEPH G. STERLING, *Sec'y-Treas.*

INDIANAPOLIS BRANCH

The Indianapolis Branch of the American Electroplaters' Society held its monthly meeting on December 6, 1944 at the Riley Hotel. A dinner was served at 6:30 P.M. and the business meeting was called to order by our President, Mr. A. L. Chesterfield.

Routine business was disposed of as quickly as possible so Mr. Frank Savage, second vice-president of the National Society, could discuss with us the A.E.S. research program. He told us of research work in progress, research work to be undertaken, how the research program originated and the purpose, aims and objectives of the program. Mr. Savage emphasized the need of money to carry a well planned program to completion and suggested that a committee be appointed to contact all small job shops for contributions and that each member of the Society also contribute to the research fund.

The Indianapolis Branch of the American Electroplaters' Society carried out Mr. Savage's requests. Mr. Chesterfield appointed a committee to contact small shops and explain the benefits they shall receive by contributing to the research fund. The members of the Branch also levied upon themselves a fee of $1.00, due May 1, 1945, and to be given to the research fund.

Mr. Repp informed us that Lt. Joseph B. Schwartzkopf had been killed while on duty for his country. Lt. Schwartzkopf was a member of the Indianapolis Branch and more recently a member of the Fleet Air Wing 5, United States Navy.

Fourteen members of the Anderson Branch were transferred to the Indianapolis Branch of the American Electroplaters' Society. They were:

Mr. Wilson White, Associate Member; Mr. R. M. Wagner, Active Member; Mr. G. A. Cheney, AssociateMember; Mr. F. W. Whipple, Active Member; Mr. D. A. Cotton, Active Member; Mr. Charles Hauri, Active Member; Mr. E. R. Unruh, Active Member; Mr. M. M. Beckwith, Associate Member; Mr. E. L. McKinney, Associate Member; Mr. Fred L. Brower, Associate Member; Mr. Orville Stewart, Associate Member; Mr. Rex Oyler, Associate Member; Mr. Lyle Williams, Associate Member; Mr. Chester Wilson, Active Member.

The Indianapolis Branch also elected Kyle B. Kern to Associate membership.

The speaker of the evening was Mr. Frank Savage. He used as his subject "Copper Electroforming" and gave us a definition of the word "electroforming" along with a history of its development. Mr. Savage also told us why the copper electroforming was undertaken, the problems encountered in its development, its application in making musical instruments and showed us diagrammatical set ups of the electroforming set ups as used by C. G. Conn, Ltd. He concluded his talk by emphasizing conditions necessary to carry such a program to completion.

A large number of questions were asked the speaker upon completion of his talk.

The meeting was adjourned at 11:00 P.M.

The Indianapolis Branch of the American Electroplaters' Society held the first meeting of the New Year, January 3, 1945 at the Hotel Riley, Indianapolis, Indiana. A chicken dinner was served at 6:30 P.M. The business meeting was called to order at 8:00 P.M. by our President, Mr. A. L. Chesterfield, and was attended by 35 members and guests.

Mr. Chesterfield introduced Lt. Craig, a Piper Cub pilot in the Artillery and more recently a patient of Billings General Hospital, who told us of his experiences in the Army. He told us of his training in the United States and Great Britain, the part he played in

the invasion of St. Lo, and how the Artillery used Piper Cub airplanes to a great advantage. The speaker enumerated a number of humorous events which had occurred during his service in the Army. He concluded his talk by answering a number of questions asked him by members present and by thanking the Branch for asking him to speak at their meeting.

The remainder of the evening was devoted to old and new business of the Branch. The Secretary's and Treasurer's reports were read and approved as read.

The Indianapolis Branch elected Harley K. Grund to Active Membership and Lawrence C. Hesoun to Associate Membership.

The Indianapolis, Dayton, Cincinnati joint meeting was discussed. President Chesterfield discussed with us tentative plans he had made for holding the joint meeting in Indianapolis. He pointed out that we had ample time to work out a well planned program. He appointed several of the members to check on details which must be worked out immediately and instructed them to report back to the Branch at its next meeting to be held February 7, 1945. The date of the joint meeting has been tentatively set for May 19, 1945 and shall consist of an educational session followed by a dinner dance.

The meeting was adjourned at 9:45 P.M.

CARL R. MORRIS, *Sec'y-Treas.*

LANCASTER BRANCH

The Lancaster Branch of A.E.S. met this evening at 8 o'clock. There were 15 members and visitors present. In the absence of the secretary, Mr. Hovis read the minutes of the December meeting. They were approved. The report on the Research Foundation was made.

After the business the speaker, Dr. Mitchell of the Magnus Chemical Co., was introduced. He spoke on the subject of Emulsion Cleaners. Dr. Mitchell outlined the background of Emulsion Cleaners and their application to metal cleaning. After enlarging on the application of the emulsion cleaners and their cost. Dr. Mitchell gave a demonstration of cleaners showing the advantage of wetting agents added to cleaners.

The lecture was followed by a period of discussed in which Dr. Mitchell answered the various questions of the members.

The meeting was adjourned at 10 o'clock P.M.

WILLIAM H. FORDNEY, *Secretary*

BALTIMORE-WASHINGTON

The January meeting of the Baltimore-Washington Branch was held on Wednesday, January 10 at Marty's Restaurant, 17 E. Lafayette St., Baltimore, Md. A new attendance record was set with 81 members and guests present for dinner and 87 for the meeting. The speaker of the evening was Mr. Sidney Boyar of Frederick Gumm Chemical Co., Inc. He spoke on two subjects. The first was "Surface Treatment of Magnesium" in which the various methods in current use for providing corrosion resistant coatings for magnesium were discussed. Bath formulae and methods for preparation of the work were discussed in detail. The second subject was "Superimposed Alternating Currents." Mr. Boyar illustrated the electrical principles involved by blackboard drawings and charts. Several processes of this type are in use in Europe. There is only one in use in this country. The combination of superimposed alternating currents and the special solutions used provide greater uniformity of deposits and make possible current densities up to 500 amperes per square foot. The special solutions contain high concentrations of metallo-organic addition agents which are sometimes in excess of the total concentration of inorganic salts. Mr. Boyar showed samples of Hull Cell plates of cadimum and copper with and without the use of alternating currents. The differences were quite apparent. The proportions of A.C. to D.C. vary with the metal being deposited. It is stated that part of the advantage gained is through the depolarizing effect of the alternating current. The talks were followed by very animated discussion.

It was announced that the Baltimore-Washington Branch Directory will soon be ready for mailing.

RAYMOND STRICKLEN, JR., *Secretary*

BOSTON BRANCH

Boston Branch met Thursday, January 4th at the Statler Hotel, Boston, with President Swift in the chair.

Minutes of the previous meeting read and approved. Communications read and placed on file. Bills read and ordered paid.

The Silver Jubilee banquet committee made its report and the banquet will be held Saturday, March 3, 1945 at the Statler Hotel, Boston, all members and their friends will be welcomed — so make your reservations now!

The following were approved by the Board of Managers and elected to membership: Alfred L. Goddard, 16 Tyler Park, Lowell, Mass., Active; John H. Mengel, 11 Mansfield St., Everett, Mass., Active; Arthur Gilbert, 122 High St., Somersworth, N. H., Associate; Emerson H. Newton, 82 Edgemoor Ave., Wellesley, Mass., Associate, Ingwell M. Johnson, 84 Oak St., East Natick, Mass., Active; Salvatore Franco, 7 Chesterton St., Roxbury 19, Mass., Active; Elliot Charney, P.O. Box 397, Church St. Annex, New York 8, N. Y., Room 1162, Associate; James G. Bellino, 118 Suffolk Ave., Revere, Mass., Associate, Alexander Ruddock, Dept. 404-2 Tube Bldg., Raytheon Mfg. Co., Waltham, Mass., Active, and George Heeney was reinstated, his address is 19 Garrison St., Boston, Mass., Active.

The following applications were turned over to the Board of Managers for approval: Fred Orcutt, Brown St., Billerica. Mass., Active Emory G. Stewart, 36 Thorpe Rd., Needham Heights, Mass., Active; Louis C. Berman, 6 Nazing Ct., Roxbury, Mass., Active; Aldo S. Berchielli, 1808 Mulford Ave., New York 61, Active; Rene J. Sauvageau, 19 Bryant St., Salem, Mass., Active.

With all regular business finished the chair was turned over to our librarian he had as the speaker Mr. Harold Narcus, Chief Chemist of the Plating Processes Corp. of Holyoke, Mass. His subject was the "Deposition of Metallic Coatings on Plastics."

He especially emphasizes the quantity processing of plastics which is a problem we may all face in the near future. This talk was illustrated by slides, he answered all questions for the members and was given a rising vote of thanks for his interesting talk.

A. W. GARRETTT, *Sec'y-Treas.*

CHICAGO BRANCH

The Chicago Branch held its regular monthly meeting on Friday, January 12, 1945 at the Midland Hotel.

The meeting was called to order by President R. J. Hazucha who explained that during the month the Atlantic Hotel had cancelled our meeting place and we were compelled to find a new hall for this meeting.

Applications were received from Mr. H. Hauseman and Mr. S. Lee.

Mr. H. W. Armstrong, W. U. Mercer, W. F. Bowler and B. Janetzke were elected to membership.

Chairman of the Banquet Committee, Mr. J. W. Henlon reported that the banquet will be held in the Palmer House as planned.

Chairman of the Educational Session, Mr. C. W. Carter reported that the Educational Session was to be held in the Club building of the Palmer House.

Mr. E. Lyons, Chief Chemist of Meker Co., talked on "What is a Clean Surface."

A rising vote of thanks was given to Mr. Lyons for the interesting comments, suggestions and descriptions of dirty surfaces that are plated upon.

There were 75 in attendance and the meeting adjourned at 9:45 P.M.

M. H. LONGFIELD, *Secretary*

HARTFORD BRANCH

The January open meeting of the Hartford ranch was held on Monday evening, January 15 at the Hotel Garde.

President Art Logozzo opened the meeting at 8:15 and introduced Ike Newell who acted as technical chairman for the evening. Mr. Newell presented the speakers, Richard Blackburn, Director of Research, and Jules Pinsky, Research Engineer of the Crystal Laboratories, Hartford, Conn. The subject of Mr. Blackburn's address was "Quartz and Quarts Crystals" and Mr. Pinsky's topic was "Review of Supersonic for Metal Finishing."

This was the first public discussion of Supersonics and their relation to metal finishing and these men had something of great interest to the plater. Mr. Blackburn's talk on quartz tied in with Mr. Pinsky's discussion of Supersonics to make the subject more understandable.

Ovide Hogaboom, pinch-hitting for his father, G. B. Hogaboom, Sr. presented our regular monthly feature, "Latest Developments in the Finishing Industry." As an added feature to this month's meeting, Ike Newell arranged a display of plating on non-metallics by the evaporation method.

The meeting was adjourned at 10:30 with a rising vote of thanks to the speakers. There was an attendance of 50 persons.

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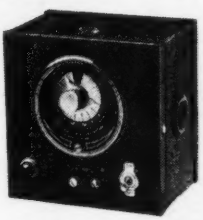

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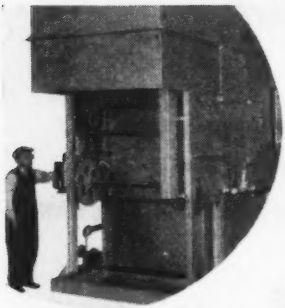

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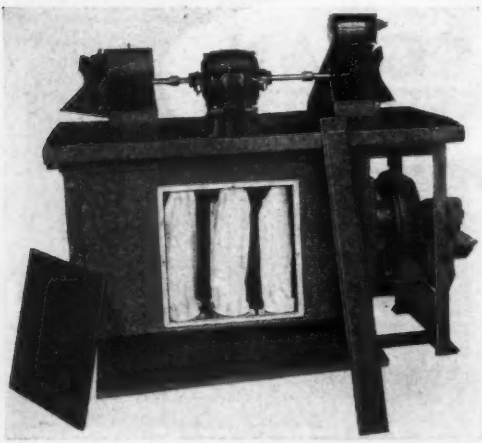

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BOSTON meets at the Hotel Statler, Boston, Mass., first Thursday each month. Secretary, A. W. Garrett, 35 Rosemont St., Dorchester, Mass.

BRIDGEPORT meets first Friday of each month at Chamber of Commerce Rooms, Stratfield Hotel. Secretary-Treasurer, Joseph G. Sterling, 134 Colony St., Bridgeport 8, Conn.

BUFFALO meets second Friday of each month at Hotel Statler, Buffalo, N. Y. Secretary J. C. Mays, 8436 W. Rivershore Dr., Niagara Falls, N. Y.

CHICAGO meets second Friday of each month at 8 p.m., Atlantic Hotel, 316 S. Clark St. Secretary, M. H. Longfield, 1528 South 61 St., Cicero 50, Ill.

CINCINNATI meets on fourth Thursday of each month at 8 p.m., at the Engineering Society Headquarters, McMillan St. and Woodburn Avenue, Cincinnati, Ohio. Secretary-Treasurer, Elliott W. Horning, 2425 Kenilworth Ave., Norwood 12, Ohio.

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GRAND RAPIDS meets second Friday of each month, 7:30 p.m., at the Rowe Hotel. Secretary-Treasurer, C. E. Abel, 11 Scribner Ave., Grand Rapids 4, Mich.

HARTFORD meets third Monday of each month alternately at Hartford Electric Light Company, Hartford and at the Elks Club, corner South and Main Sts., Bristol, Conn. Special meetings are held at the New Britain Trade School, New Britain, Conn. Secretary, F. W. Smith, 46 Cottage St., Meriden, Conn.

INDIANAPOLIS meets at the Hotel Riley, the first Wednesday of each month. Secretary-Treasurer, Carl R. Morris, 1828 N. Pennsylvania, Indianapolis, Ind.

JACKSON-LANSING meets second Tuesday of each month alternating between Home Dairy at Lansing and Hotel Hayes at Jackson. Secretary-Treasurer, C. E. Topping, 1104 S. West Ave., Jackson, Mich.

LANCASTER meets second Friday of each month at 8 p.m., at Thaddeus Stevens Industrial School, Lancaster, Pa. Secretary-Treasurer, W. H. Fordney, 603 Marietta Ave., Lancaster, Pa.

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NEWARK meets first and third Friday of each month at Hotel Robert Treat, Newark, N. J., at 8 p.m. Secretary-Treasurer, George Wagner, 1130 So. Long Ave., Hillside, N. J.

NEW HAVEN meets the first Tuesday of each month at Sterling Chemistry Laboratory, Yale University. Secretary-Treasurer, B. J. Gaffney, 40 Filbert St., Spring Glen, Hamden 14, Conn.

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PHILADELPHIA meets fourth Friday of each month, in the Harrison Laboratory Building, University of Pennsylvania, 34th and Spruce Sts. Secretary, Paul Mentzer, Sr., 7242 Bingham St., Philadelphia 11, Pa.

PITTSBURGH meets first Thursday of each month, at 6:30 p.m. at the Roosevelt Hotel, Pittsburgh, Pa. Secretary-Treasurer, Frank Keller, 1102 Hiland Ave., Coraopolis, Pa.

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ROCHESTER meets third Friday of each month at the Hotel Seneca, Rochester, N. Y. Secretary-Treasurer, Donald C. Blum, 672 Mt. Read Blvd., Rochester, N. Y.

SAN FRANCISCO meets the last Thursday of each month, usually at Angelo's, 4307 San Pablo Avenue, Oakland, Calif. Secretary-Treasurer, Arthur Kistler, 15th and Vermont Sts., San Francisco, Calif.

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SYDNEY, AUSTRALIA. Secretary-Treasurer, Lawrence Smith, Box 2064, G.P.O., Sydney, Australia.

SYRACUSE meets second Friday of each month at Bowne Hall, Syracuse University, Syracuse, N. Y. Secretary, Neil Maffei, 206 Union Ave., Syracuse 3, N. Y.

TOLEDO meets first Thursday of each month, in the office of the Vic Miner Co., 329 20th Street, Toledo, Ohio. Secretary, Gaston Bergeman, 718 Howland St., Fremont, Ohio.

TORONTO meets second Friday of each month at Royal York Hotel, Secretary, E. P. Blandy, 369 Prince Edward Drive, Toronto 9, Ont., Canada.

TWIN CITY BRANCH. Secretary-Treasurer, Robert Buckley, 1410 Quincy St., N.E., Minneapolis 13, Minn.

WATERBURY meets second Friday of the month at Elton Hotel. Secretary-Treasurer, Spencer L. Henn, Apothecaries Hall Co., Waterbury 88, Conn.

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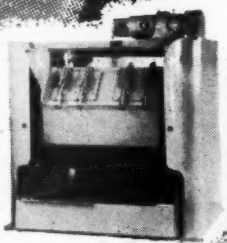

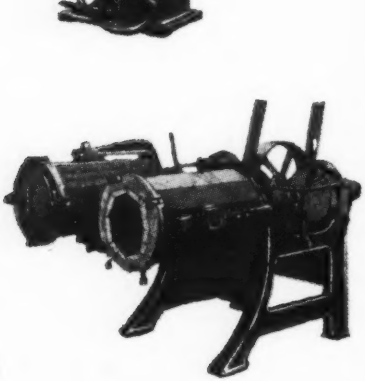

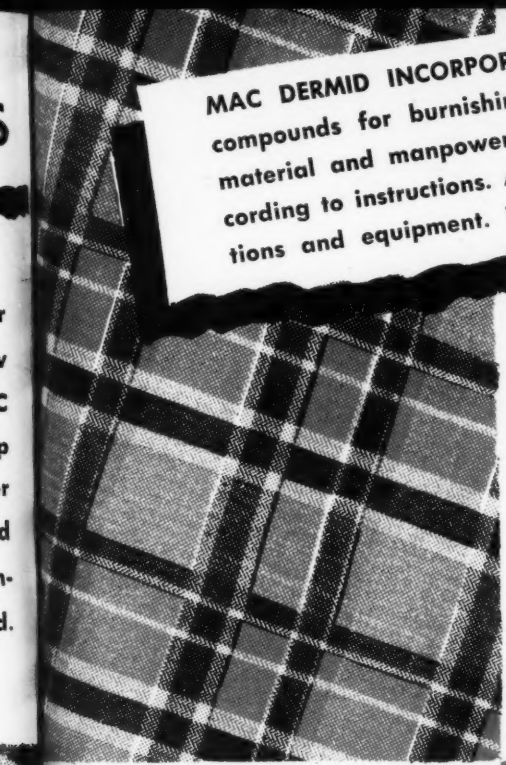

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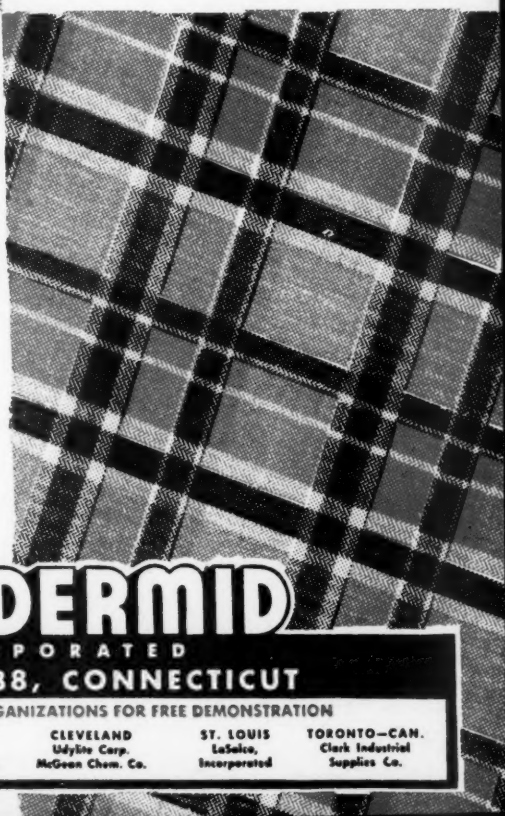

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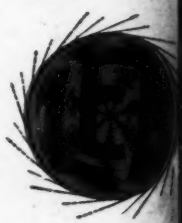

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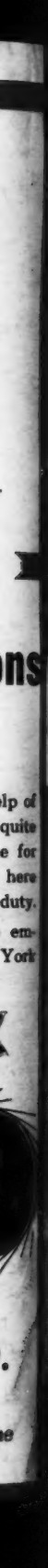
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